1751
XLII

TECHNICAL FILE

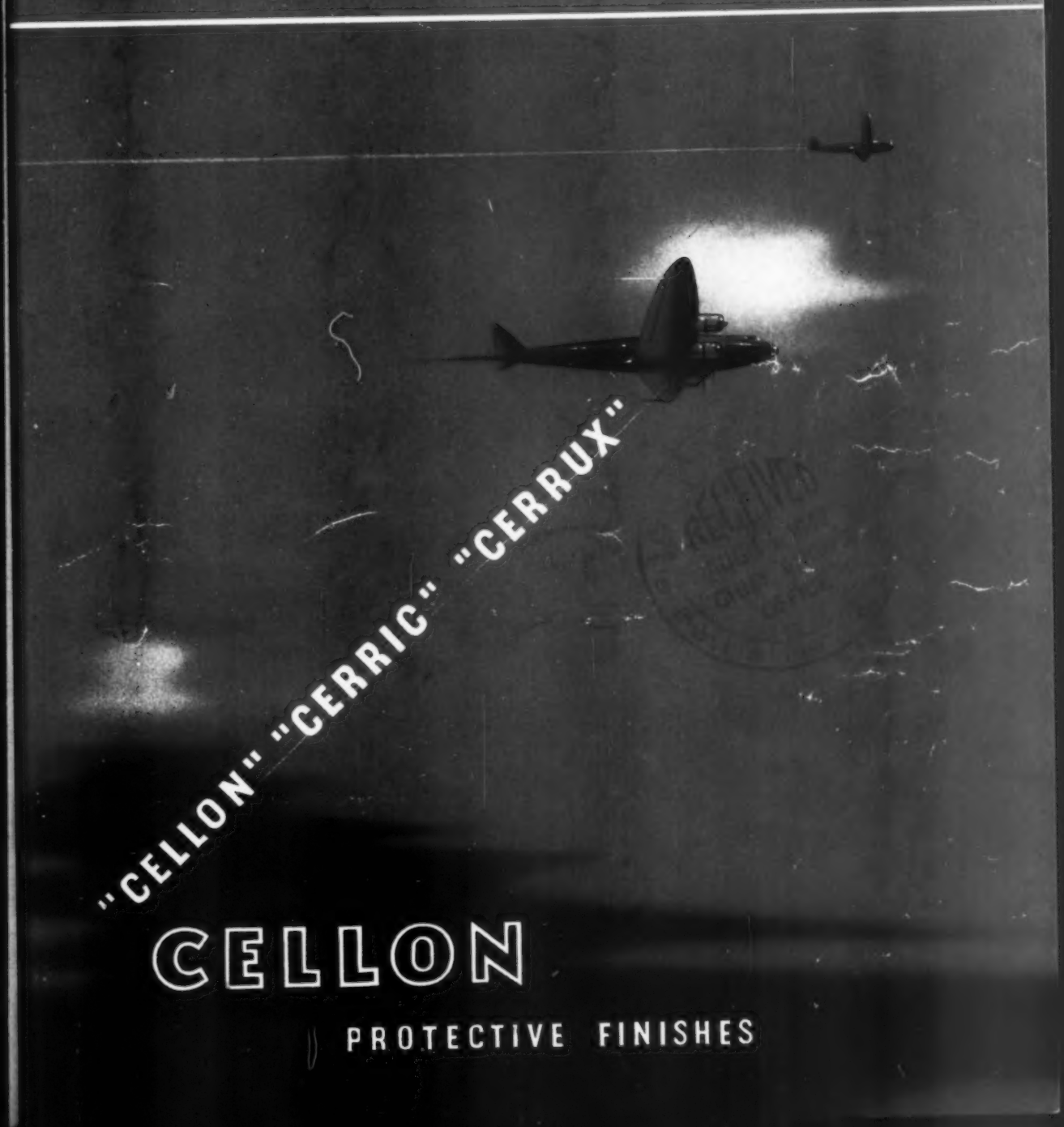
1/-

FLIGHT

and The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

JULY 16th, 1942



"CELLON" "CERRIC" "CERRUX"

CELLON

PROTECTIVE FINISHES

"Bristol"

Beauforts. Beaufighters and Blenheims, of Coastal Command, all took part in the attack on the cruiser Prinz Eugen on the evening of May 17th.

The chief part in the fight was played by the Beauforts led by Wing Commander M. F. D. Williams. In spite of the escort of four destroyers, two of the Beauforts' torpedoes and probably a third, hit the target, and others were seen to be running well towards it. The part played by the fighters was most gallant. The Beaufighters raked the decks of the enemy ships and with the Blenheims gave protection to the torpedo carrying Beauforts.

"It is a remarkable tribute to our crews and 'planes—all the latter, excepting the Hudsons, came from one British factory—that five German aircraft were shot down and a number of others damaged."—*The Daily Mail.*

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor C. M. POULSEN

Managing Editor G. GEOFFREY SMITH, M.B.E.

Chief Photographer JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8-10, CORPORATION ST.,	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE,	26B, RENFIELD ST.,
Telegrams: Autocar, Coventry.	*Telegrams:* Autopress, Birmingham.	*Telegrams:* Iliffe, Manchester.	*Telegrams:* Iliffe, Glasgow.
Telephone: Coventry 5210.	*Telephone:* Midland 2971 (5 lines).	*Telephone:* Blackfriars 4412.	*Telephone:* Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £3 1 0. 6 months, £1 10 6. 3 months, 15s. 3d.
Registered at the G.P.O. as a Newspaper.

No. 1751. Vol. XLII. JULY 16th, 1942. Thursdays, One Shilling.

The Outlook

Army Co-operation Again

IT is often said that the ordinary Army officer knows practically nothing about the air and its capabilities, and this is probably true. From this it is often assumed that he is incapable of learning anything useful about the subject. Before admitting this to be correct, one should remember that the Army itself is not one homogeneous body. The ordinary infantry officer, artillery officer or tank officer knows very little about the detailed work of any arm except his own; yet Generals and their staff officers have to know enough about all arms to be able to assign to each its proper rôle in a battle. There is no reason why they should not also learn what part the air arm can play, even though they know little about the handling of a joystick or the mechanism of a v.p. airscrew.

In the House of Commons last week one Member suggested that the Army, particularly in Libya, ought to have part of the Air Force clearly under its control. He overlooked the fact that for many years past the tactical reconnaissance squadrons have been under the direct operational control of the Generals commanding divisions or other Army formations, but probably he meant that this practice should be extended to include bomber and fighter squadrons.

The Prime Minister replied that he had gone further than that, and had laid it down that the entire Air Force should be subordinated to the purposes of the military commander. Before a battle the Army Commander-in-Chief would specify to the Air Officer Commanding-in-Chief the tasks which he required to be performed, and it was for the latter to use his maximum force for those objects.

One rather doubts if that arrangement covers all the emergencies which will arise in battle. It seems to us that a subordinate Army commander ought to be able to ask for air help in a hurry, and to ask for it directly from those who can give it. In the last war the observer in an R.F.C. machine (which, by the way, belonged to the Army) was able to send out a zone call which immediately turned all the guns within range on to a special fleeting target. The reverse process ought to be possible now. A tank regiment, for example, if held up by anti-tank rifles, ought to be able to summon air bombers to disperse the opposition, and the response should be immediate—provided the bombers were available. Correct channels of communication, going up to the G.O.C.-in-C., passed by him to the A.O.C.-in-C., and presently filtering down to the squadron, would be an absurdity, and we do not believe that the Panzers and Stukas worked together that way in any German campaign. But what our present arrangements are has not been made clear.

Scraps of Information

THE Air Ministry News Service has just issued a short article dealing with the Army Co-operation Command of the Royal Air Force. It gives the minimum of information, but one does learn from it that the Command includes "squadrons of bombers, medium bombers, and fighters," that many of the machines, bombers as well as fighters, are piloted by officers seconded from the Army, that the Command has been growing in size, and that "Army co-operation in Libya and Egypt has been much practised."

Previous to the retreat to El Alamein the Middle East

bulletins had little to say about close air support for the ground forces in battle (which is what the term "Army co-operation" mainly suggests), and the function allotted to the Air Force was clearly to interrupt, so far as possible, the enemy supplies from reaching Rommel's fighting troops. It appears that since General Auchinleck took command and began his stand at Alamein the air squadrons have changed their policy, and have been playing an active part in the fighting. They are reported to have been attacking the Axis troops as well as their supply lines, and to have been doing so with considerable effect. All reports lay stress on the tremendous effort of the R.A.F., but there has been so far no suggestion that new classes of aircraft, such as dive-bombers or tank-busters, have recently been received. The only novel reinforcements mentioned have been American heavy bombers, which, quite rightly, have been used for raids on Benghazi and Tobruk harbours, not for close support of the ground troops—a task for which heavy bombers are not suited.

One wonders why this sudden change has come over the Libyan scene. Is it due to the presence of General Auchinleck in person, or does it merely mean that the Axis forces are now so thickly crammed into a narrow front that they provide better targets for air action than they did while the battle wandered over a much wider area? Or have the preparations and studies of the Army Co-operation Command suddenly borne fruit? Probably the answer is: Both.

A Raw Deal

AS from Monday of this week the Air Training Corps came under the direct control of the Air Ministry, the post of Commandant having been abandoned and Air Commodore Chamier becoming Inspector of the A.T.C.

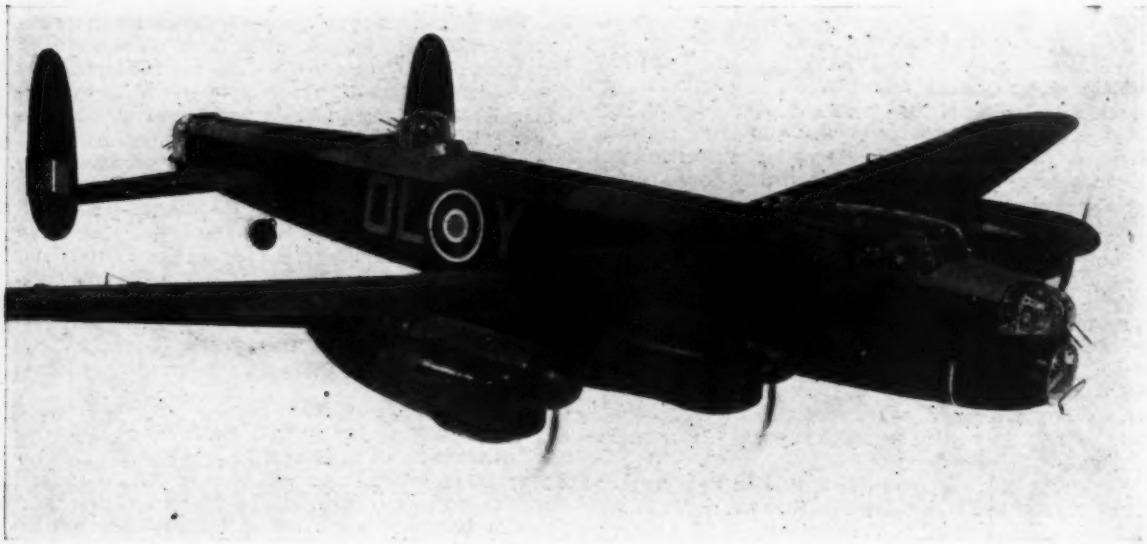
This action by the Air Ministry appears somewhat high-handed, in view of the fact that if it had not been for Air Commodore Chamier there would have been no A.T.C. As Secretary-General of the Air League of the British Empire, Air Commodore Chamier conceived the idea of forming the Air Defence Cadet Corps, which quickly grew to a very impressive size.

Then the war broke out and, after a time, the A.D.C.C. was disbanded and the A.T.C. took its place, with Air Commodore Chamier as Commandant, the Air Ministry agreeing to wind up the financial part of the A.D.C.C., the squadrons of which became A.T.C. squadrons. The title of the *Air Cadet* journal was changed into the the *A.T.C. Gazette*, but it continued to be run by the Air League, and very efficiently run under the editorship of Mr. Leonard Taylor.

No one who knows the dynamic personality of Air Commodore Chamier is likely to be optimistic about the chances of the A.T.C. being more efficiently run under Air Ministry control than it was under his, and it is impossible not to feel regret that he has been deprived of the command of the corps which he has built up.

CONTENTS

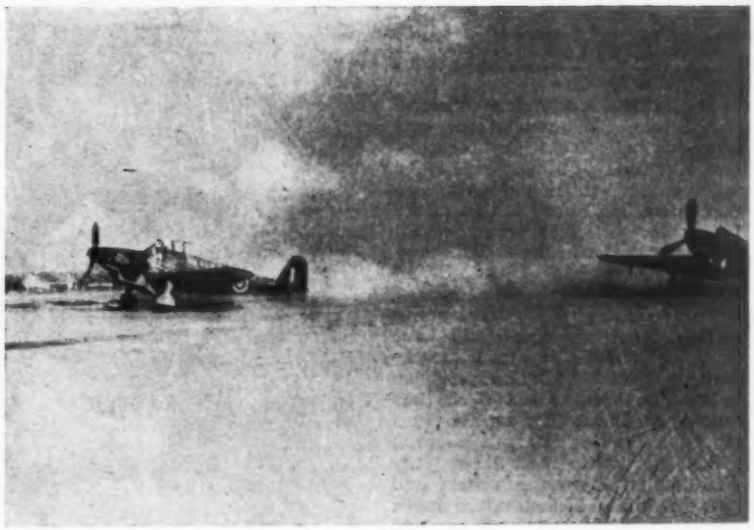
The Outlook	55	Ahead of Their Time—6	67
War in the Air	57	Japan's Power Units	70
Here and There	60	Behind the Lines	73
Voices from the Past	61	In Parliament	74
Army Co-operation	62	American Military Transport	75
The B. V. 141	64	Correspondence	76
Adventure of a Tiger Moth	66	Service Aviation	77
Aircraft Characteristics	66, a and b		



SUBMARINE CHASER: A striking flying picture of the Avro Lancaster. Last week-end several squadrons of Lancasters made daylight flights to Danzig and Flensburg on the Baltic coast, where they attacked submarine yards and slipways. The round trip meant some 1,750 miles' flying, but only three machines were lost in this operation. It will be remembered that Lancasters were used for the famous daylight raid on the submarine diesel engine plant at Augsburg in April. Dimensions of the Avro Lancaster are :—span, 102ft.; length, 69ft.; height on ground, 19ft. 7in. Maximum speed is about 300 m.p.h.

War in the Air

Army and Air in Egypt : 4,000lb. Bombs on Wilhelmshaven : The Struggle in Russia



SEA BIRDS TO THE RESCUE : Fairey Fulmar fighters taking off from an airfield in India.

ON the body of a German soldier killed in Russia a letter was found which contained the following passage: "Our last mail made an overwhelming impression. The words 'Cologne' and 'Essen' are on everybody's lips. Relations write terrible things. Friedrich was told that life at home had come off the rails, and people simply cannot recover from this dreadful disaster."

Such impressions, however, do not prevent the German soldiers from fighting bravely, and in the awful carnage which has been going on at Sevastopol and on the other Russian fronts the German troops who pressed on, piling up the battlefields with their corpses, were undoubtedly very brave men. Nor is there any indication that the spirit of the civilian population has been broken to an extent that would tend to shorten the war. On the contrary, observers have written that such adversity as the German armies have suffered has tended to knit the civilians into a more resolute determination than before. The good done by Bomber Command raids is in the actual destruction of factories and dislocation of work, not in breaking the determination of the German people to hold out. After all, there are innumerable towns in Germany which have not been bombed and never will be bombed. Perhaps some day the *Luftwaffe* chiefs will realise that the British people are even less likely to collapse under methods of frightfulness. The bombers which they lost in the Baedeker raids were pure loss, with no compensating advantage.

Dynamic Defence

IN the El Alamein battle in Egypt the Axis attacked furiously for five days, during which General Auchinleck gave a great exposition of dynamic defence, using his battle groups and mobile columns to harry the flanks and threaten the rear of the attackers by day and night. His nearness to his bases facilitated these tactics. Then came a lull, while Rommel "refused" his right flank, drawing it back for some 30 miles so as to prevent the British columns from working round behind it. But the lull did not apply to the R.A.F., which carried on its ceaseless bombing of the enemy by night as well as by day. It would seem that General Auchinleck has exercised a more direct control over the air operations than prevailed when the fighting was centred on Knightsbridge, and certainly the aircraft have not confined their energies to striking at the enemy supply lines, but have also vigorously attacked his fighting troops. The latter were massed in a comparatively small area, and offered concentrated targets to our bombers and fighters. Fighter-bombers proved very useful in this kind of engagement, but all classes were used, and Bostons were constantly in action.

German and Italian prisoners complain bitterly of the terror caused in their ranks by the low-flying attacks of the R.A.F., and also of the lack of protection given by their own aircraft. One must not take the latter complaint quite at its face value as soldiers almost invariably complain if they see enemy aircraft and suffer from them but do not see their own. The B.E.F. men from Dunkerque raised the same complaints, not knowing how much they actually owed to Fighter Command. The Axis men in Egypt have better grounds for their indignation.

In six weeks' fighting in the desert the Axis has lost 284 aircraft, of which

ALL ABOARD : Russian paratroops getting into their A.N.T. 6, an out-of-date bomber type which our Allies use for paratroop and air transport work.

WAR IN THE AIR

134 were shot down in air combat, 50 by A.A. fire, while at least 100 were destroyed in attacks on airfields. Since May 23rd 59 Stukas have fallen victims to our fighters and guns. Another interesting record is that of the Malta defences, which accounted for 41 enemy aircraft in the first six days of July.

Some American heavy bombers of the U.S. Army Air Corps have appeared upon the scene and have joined with our Wellingtons in attacks on the ports of Tobruk and Benghazi. On Monday evening last week they made a combined raid on Benghazi just before dusk. Though a storm of *flak* rose up to meet them, they went straight in to the attack, and the first bombs kicked up so much dust that the following crews could scarcely see their targets. One American crew scored a hit on a supply ship in the harbour, and the result was described as "terrific." Explosion followed explosion, and large pieces of the ship were seen by our crews to be flying through the air. Rommel's guns will not get much provender out of that ship. Unfortunately, we cannot stop all the Axis ships from delivering their goods.

Close Support

AN interesting item has been mentioned in an Air Ministry bulletin which deals with the Egypt battle. On one day fighter-bombers started at dawn to attack enemy armoured units, though, by the way, their successes seem to have been scored against tankers rather than against tanks. The bulletin goes on: "Several times during the day their targets were switched. Once, in response to an Army request, they sought out and bombed enemy gun positions." This indicates that things have changed of late, for in the recent Censure debate in the Commons Flt. Lieut. Boothby, M.P., told how he had heard from R.A.F. officers back from Libya that then no one in the front line could say, "I want two fighter squadrons at point B in ten minutes," and be sure that they would be there. Close support is evidently now the order of the day, though how things are worked and what are the channels of communication and orders has not been revealed.

Some interesting items of news come from India. One is that Fulmar fighters have been operating there. Fulmars are naval aircraft, usually working from a carrier, and how and why they got to India has not been explained. Another incident concerns an internal affair, not directly connected with the war, but bearing on it. A tribe called Hurs in the province of Sind (of which Karachi is the chief town) have been raiding and holding up trains. They may have been incited to do so by Axis agents, but, anyway, armed police and military forces have had to tackle them. In the course of the operations a strong detachment of Indian parachute troops led by a British officer dropped into the middle of the Hur country and went into action. Little had been heard before of parachute troops in the Indian Army, but it is satisfactory to know that their training has advanced so far, and this bit of practice was doubtless very valuable to them.

POTENTIAL CATERPILLARS: Pilots of a Rhodesian army co-operation squadron of the R.A.F. repacking their parachutes.

"WERE YOU HAPPY AT YOUR WORK? War correspondents in Egypt interviewing an Italian pilot who had just been shot down.

A Useful Raid

A HEAVY force from Bomber Command attacked Wilhelmshaven last week. It included some four-engined machines, and among the bombs dropped were some of the mighty ones which weigh 4,000 lb. Wilhelmshaven is another of the places where submarines are built, and it is to be hoped that its activities have been at least curtailed by this visitation. The men who work in the yards must have had a most unpleasant shock. Bomber Command is certainly doing its very best to help the Navy in the Battle of the Atlantic, even though it is rather inclined to regard such activities as interruptions to its own special work.

ENEMY AIR LOSSES TO JULY 11th

		Over G.B.	Over Continent	Middle East
July	5	0	0	20
"	6	1	2	0
"	7	4	0	10
"	8	0	2	34
"	9	0	0	17
"	10	0	0	15
"	11	1	0	28
		6	4	124

Totals: West, 6,047; Middle East, over 4,250.

Another daring raid by Bomber Command took place by daylight on the evening of Saturday last, July 11th. Several squadrons of Lancasters set out for Danzig and the neighbouring port of Flensburg, both of which are centres of U-boat construction. The Danzig raid involved a flight of 1,750 miles, and was the longest daylight operational flight ever made by our bombers. The weather was filthy, and numerous thunderstorms as well as violent winds were met by our squadrons. Some of the navigators completely lost their way, which is easy to understand in such conditions, and had to return to their bases. On arriving over Danzig the Lancasters came down below the clouds to bomb, and some machines flew very low indeed. There was much *flak*, but no German fighters were met, partly perhaps because the place was taken by surprise, partly, no doubt, on account of the weather. Some of our bomb-aimers were sure that they hit the U-boat yards. Only three of the Lancasters failed to return.

WAR IN THE AIR

Fierce Fighting in Russia

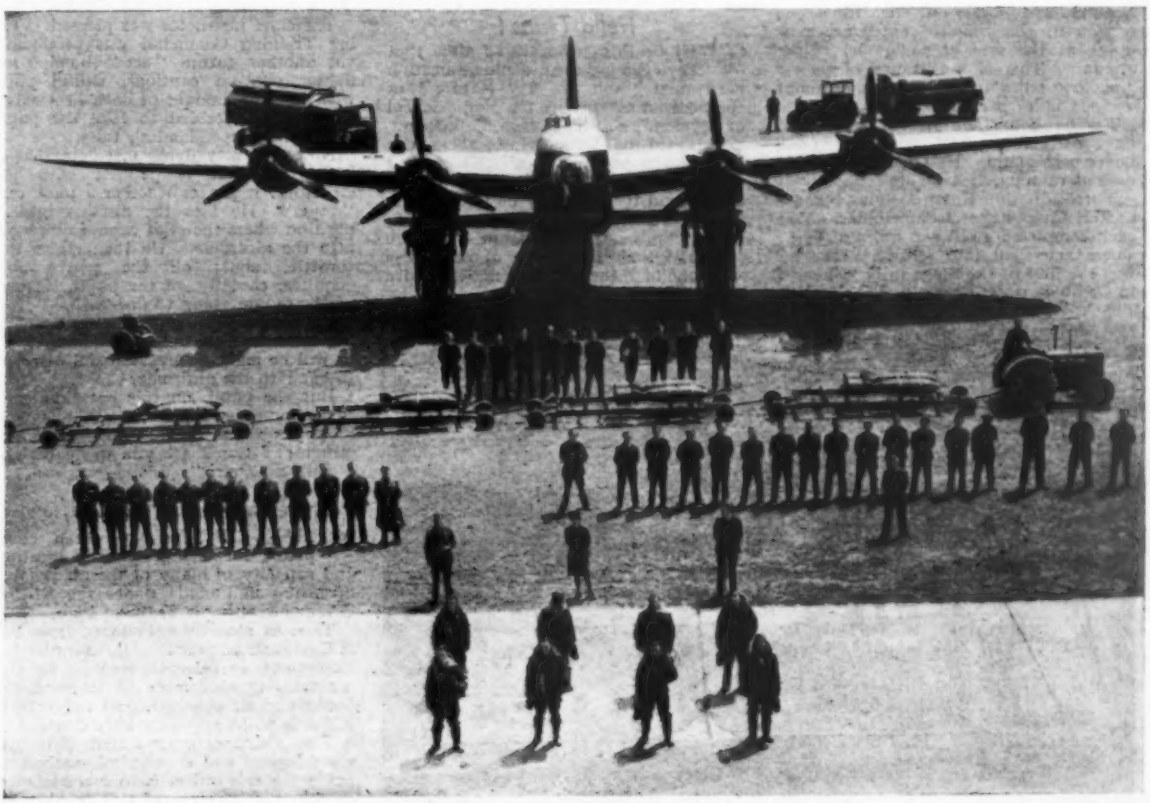
AT the moment of writing the Russians are fighting hard to retard the great German offensive which is pivoted on Kharkov. This has been expected ever since the winter, but has materialised rather late in the summer. Bock, the German General, has a superiority in numbers of aircraft, and it is reported that the *Luftwaffe* on that front has been reorganised. A number of "shock groups" has been formed, on the principle of the fighter "circus" of the last war which has been connected with the name of Manfred von Ritchhofen, but now including various categories of bombers as well as fighters. These can be moved rapidly from place to place so as to achieve unexpected air superiority overnight at a critical point. One of these groups is under another Richthofen, stated to be a cousin of the late Manfred. In order to save time, even at a sacrifice of fuel, the Germans have been flying up aircraft to the front from factories or bases even as far away as Munich.

Some of the mobile air groups contain as many as 600 to 700 machines, and it has been observed that before an offensive opens the Germans often move from 500 to 600 aircraft to appropriate advanced bases. There are reserves behind.

BRITISH AIR LOSSES TO JULY 11th

		Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
July	5	0	0	0	10
"	6	0	2	0	0
"	7	0	0	0	4
"	8	0	4	0	9
"	9	0	3	0	9
"	10	0	0	0	3
"	11	0	5	0	13
		0	14	0	48 (13 pilots safe)

Totals: West, 4,116; Middle East, about 1,420.



This photograph shows a Short Stirling and over 50 personnel who are immediately connected with keeping the machine serviced and flying. They include an aircrew of 8; Met. officer; W.A.A.F. parachute packer; flying control officer; flight maintenance crew of 12; ground service crew of 18; armourers numbering 11; tractor driver; oil tanker driver and fuel tanker crew of 2. Although this seems to be an enormous staff to keep one machine on service, it is but a small percentage of the number actually employed. At the close of the last war the Royal Air Force was 291,175 strong, with a total of 22,171 aircraft on charge. Of these aircraft only 3,300 represented first-line strength. The proportion of personnel to first-line aircraft was, therefore, in the region of 100 to one for the simple machines of that date. To-day it must be many more.

HERE AND THERE

A.T.C. Officer on Youth Council

FLT. LT. S. J. NOEL-BROWN, O/C. the Feltham Wing of the A.T.C., was nominated by that organisation, and was subsequently elected, to represent the A.T.C. on the Government's Youth Advisory Council.

The chairman of the council is Mr. J. F. Wolfenden, Headmaster of Uppingham, who it will be remembered, was appointed Director of Pre-entry Training when the A.T.C. was inaugurated in February, 1941.

Mr. Wolfenden was granted six months' special leave by the Governors of Uppingham for this purpose, the period being subsequently extended for a second period of six months.

Hard Worked Flying Boats

THE twelve Empire flying-boats of British Overseas Airways based at Durban and used on the Horseshoe section of the Empire routes are now flying at the rate of 20,800 hours per annum. This is a distance of nearly 3,000,000 miles and an average of about 250,000 miles per aircraft.

Engine hours for the same aircraft have reached the high figure of 83,200 hours per annum. This does not include ground running, test flights, etc.

Three of the Empire flying-boats—Castor, Canopus, and Cameronian—have each completed 1,000,000 miles of flying since they went into service. Canopus was the first of the S.23s to be delivered in October, 1936; Castor was the fifth to join the fleet, beginning service in December, 1936, while Cameronian went into service in October, 1937.

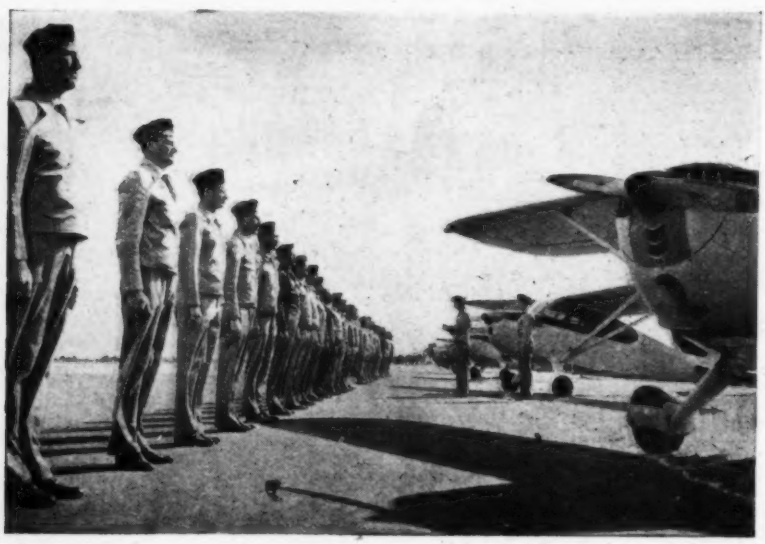
GOOD JUDGES: Mr. and Mrs. L. A. Rumbold preparing to adjudicate at the firm's sports gala. In the centre is Miss Catton, the secretary of the Rumbold Company. As in peacetime, Rumbolds still ally comfort and lightness in aircraft seats, but they are not quite so luxurious these days.

Hello Twins!

TWIN brothers who are so alike that they even use the same identification card photograph are a "feature" of the instructing staff at the Ryan School of Aeronautics at San Diego, California.

It is said that these twin brothers even have the same right tooth missing and that only by wearing different pattern clothes can they possibly be told apart.

This must be a trifle disconcerting to flying pupils not in the know who have just had their first taste of aerobatics with one of them and then unexpectedly encounter the other.



U.S. EXAMPLE: America has its Home Guard Air Arm in the form of an officers' platoon of private pilots. The light aircraft in this instance appear to be Stinson 105s, one of the many strut-braced high-wing types so popular with the Yankee private owner in peacetime.

"Now's Your Chance!"

THE pupil pilot, a tough little Scot, was getting on very well.

The chief instructor was pleased. Flying Training Command was producing yet another future "ace" bomber or fighter pilot—a cautious, skilful pilot with just the amount of dash necessary. The "C.I." decided to take the pupil up for his forced-landing tests.

Now, the wily flying instructor has a little test that is popular with instructors; it proves whether a pilot can "cope." He flies the aircraft into a position where the pilot cannot quite get into the airdrome. He then closes the throttle, shuts off the petrol and enquires, casually, of the pupil, "Now, what are you going to do?"

Question: Will the pilot, after examining the situation, force-land in a field; or will he make an unsuccessful attempt to get into the airdrome?

But the pupil, on this occasion, was silent for a few moments as he looked around. Then he answered the instructor: "Can I ask you to fly her for a while now, sir?"

Increased Observer Outflow

ARRANGEMENTS have been completed for changes in the location and capacity of many of the air schools operating in Canada under the British Commonwealth Air Training Plan.

This, as recently announced from the R.C.A.F. headquarters, is in order to implement agreements reached at the air training conference to increase the outflow of air observers and nagivators, which is to be approximately doubled.

The announcement stated that the most logical and economical method of achieving this object is to increase very greatly the capacity of the existing air observer schools, and as several of them are located in close proximity to the elementary flying training schools, the new plans will necessitate the disbandment of several elementary schools.

To compensate for their loss, the size of the remaining elementary schools is being appreciably increased.

VOICES FROM THE PAST

Recorded Talks by Schneider Trophy Contest Designers and the Winning Pilot

A "TECHNICAL hitch" was responsible for the country hearing on the radio, on July 6th, the voices of the three men who had most to do with the winning of the Schneider Trophy Seaplane Contest in 1931, the third time in succession, thus making the trophy the property of Great Britain. Jack Northrop, the well-known American aircraft designer, was to have broadcast in the "I am an Aircraft Designer" series, but was prevented, for technical reasons, from giving his talk. Instead the B.B.C. broadcast records, made at the time by Vickers, of brief talks given after the race by Mr. R. J. Mitchell, Vickers-Supermarine chief designer, Mr. A. J. Rowledge, who designed the Rolls-Royce racing engine fitted in the Supermarine S.6B seaplane, and Flt. Lt. (now Group Captain) J. N. Boothman, who piloted the S.6B to victory.

To those who knew the late R. J. Mitchell intimately it was something of a shock and rather sad suddenly to hear the familiar voice, and to reflect that the genius who gave us not only the Schneider machines but the Spitfire has gone from us for ever.

The recorded talk by Mr. R. J. Mitchell follows:—

"In the design of a seaplane of this type, the one outstanding and all-important requirement is speed. Every feature has to be sacrificed to this demand, the result of this is that every part of the aircraft just, and only just, fulfils its requirements. A very exact knowledge is therefore essential of the functioning of the details, requiring an enormous amount of research and investigation. It is not good enough to follow conventional methods of design; it is essential to break new ground and to invent and evolve new methods and new ideas.

"The important aim of the designer is to reduce air resistance. Of the total air resistance of the S.6B as much as seventy per cent. is brought about by the friction between the air and the surface of the aircraft. The shapes of the fuselage and floats are such that air resistance is very little higher than that of the purest streamline form. The floats are made so small, for the load they have to carry, that their reserve buoyancy is less than forty per cent. The usual reserve buoyancy for seaplane floats is about one hundred per cent.

No Contra-props

"The problems of float design are further increased by the enormous torque developed by the engine. The effect of this torque is to raise one float and depress the other, resulting in the aircraft swinging off its course if the balance is not maintained in some way. This is overcome by carrying a larger load of fuel in one float than in the other, calling for a very sensitive device to ensure that the balance of fuel is maintained during flight. The underwater lines of the floats are of extreme importance. Before taking the air the aircraft must accelerate to a speed of over one hundred miles an hour—almost equivalent to the world's speed record on the water. The floats must run perfectly smoothly; any instability at high speed would be fatal.

"The cooling of the engine presents many interesting features; the usual methods employed, either by air cooling or by honeycomb radiators, have very high air resistance. On the S.6B the engine is cooled without adding any air resistance. The cooling water is circulated over both surfaces of the wings and most of the surface of the floats, the covering being of a special double-skin construction. Similarly the oil is circulated along the sides of the body and over the surface of the fins. During flight heat equivalent to 1,000 h.p. is being transmitted to the air from these surfaces. The S.6B has been aptly described as a flying radiator.

"The air controls and stability in flight must be exactly right. The pilot must be very efficiently protected from the enormous air pressure and from exhaust fumes. He must get a very adequate supply of fresh air and he must have a very good view.

"I must express the very greatest admiration for the pilots of the High-speed Flight of the Royal Air Force who carried out trials and operated these machines. Their job required great courage and great skill, and they played a very important part in developing the machines to their final state.

"The question is often asked: Will higher speeds be attained in the future? I feel quite sure they will. The problems of still higher speed are no more intense at this stage than they have been at any stage in the past. For the present, however, it is generally considered that high-speed development has served its purpose. It has accumulated an enormous amount of information which is now being used to improve the breed of everyday aircraft. It is helping to develop our great air liners and ocean-going flying boats, and is thus bringing closer together outlying parts of the British Empire. This, indeed, is an objective worthy of all our greatest efforts."

Developed in 7 Months

In his talk Mr. A. J. Rowledge paid a tribute to Lady Houston, but for whose generosity the S.6B might never have been built. There had been indecision until she made her offer to defray the cost, and that left only seven months in which to develop the "R" engine to the new standards required for the 1931 contest. At a conference between the Supermarine and Rolls-Royce firms, and the Air Ministry, the Rolls-Royce engineers undertook to increase the horse-power of the engine by 400 h.p., thus bringing it up to 2,300 h.p.

Flight Lieutenant Boothman flew the Schneider course at an average speed of 340.8 m.p.h. In the broadcast recording he described his experiences in the following words:—

"The first lap was flown at full throttle, and the turns were taken rather wide in order that there should be no risk of disqualification. After about one and a half laps the water temperature started to rise above the maximum allowed for the race, and so the throttle had to be eased back slightly for the remainder of the contest. Weather conditions were good, visibility excellent, and over the sea the air was smooth, but near Southsea, where the course was slightly inland, bumpy air was experienced. Bumps on high-speed aircraft are rather disconcerting, because instead of the aircraft moving gently up or down, one experiences a sudden jar that could be felt right throughout the aircraft's structure. In view of this, after the fourth lap I flew out to seaward at Southsea in order to miss these disturbances. After about twenty minutes the cockpit became very hot and stuffy, and I was glad of the breathing tube which led a draught of cold air on to my face.

"During the fifth lap my legs began to get slightly cramped owing to the small cockpit; I rested my knees on the side of the fuselage. However I quickly moved them when I found that the cockpit walls were blistering hot, I considered the cramp was the lesser evil. During the last lap the engine was still giving the same healthy noise and the aircraft was still flying perfectly, the combination in spite of its higher speed being much smoother than a normal aircraft.

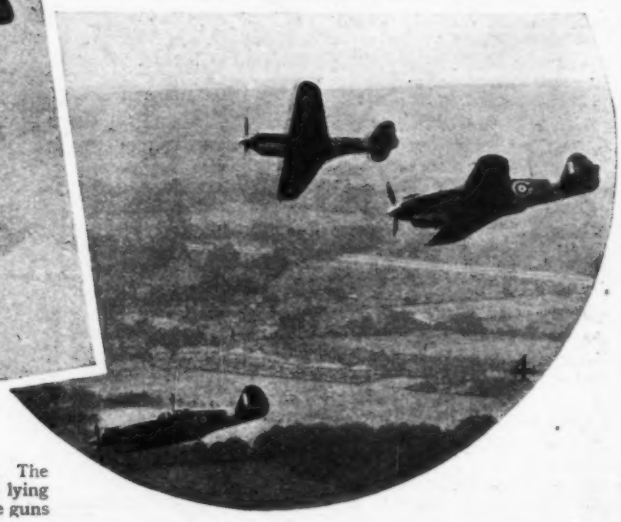
"Round at the last turn I opened the throttle full out once more for the final four or five miles to the finish, and then a climbing turn and an amble back to Calshot on about a quarter throttle at two hundred miles an hour; the final closing of the throttle; left-hand gliding turn, an alighting and the last Schneider Trophy Contest was over. Later, the same aircraft—in the hands of Flt. Lt. G. H. Stainforth, A.F.C., established the world's record for speed with 407.5 miles per hour."

ARMY C

Curtiss Tomahawk Single-seater Fighters are Used Extensively by Army Co-op. Command of the R.A.F. for Reconnaissance Work

(1) An Army officer indicates on a map the pin points of which oblique photographs are required.

(3) Fitting the oblique camera to a Tomahawk. It is situated at the rear of the fuselage tricolour roundel and remotely controlled by the pilot.



(2 & 4) Army Co-operation Curtiss Tomahawks in flight. The banked picture shows clearly the two 0.5in. machine guns lying over the 1,100 h.p. Allison engine and the two rifle-calibre guns in each wing.

COPERATION

IN the 1914-18 war almost any slow old tub of an aircraft was considered good enough for reconnaissance and artillery spotting, but this is no longer possible in 1942. If an A.C. machine is sent out on a job, it must be able to look after itself to some degree. Thus we find Curtiss Tomahawks being adapted for photographic reconnaissance, and their batteries of two 0.5in. and four rifle-calibre machine guns should give a good account of themselves if enemy interference is met.

(7) An R.A.F. photographer taking a film magazine into the mobile dark-room for processing.

(8) With wheels and flaps down a Curtiss comes in to land

(5) Inspecting photographs—in this case a line-up—and (6) plotting the information on a map.

THE B. V. 141

The Designer Comments on the Advantages of Asymmetrical Aircraft, and Explains How the Blohm and Voss Was Evolved

By RICHARD VOGT

THE author of this article is chief designer to the Blohm and Voss firm, of Hamburg, and thus his views on asymmetrical aircraft are of considerable interest. He is, however, quite wrong in stating that "Flight" has missed the main point of the idea. Evidently Herr Richard Vogt only saw our review of his patents and did not read our previous articles on the subject. His comments are here translated from the German journal "Luftwissen."

A PATENT for an asymmetrical aircraft granted in 1937 afforded the technical Press an opportunity of expressing their views. In Sweden the publicity thus given to this subject received sympathetic treatment in the Swedish journal *Flygning* of February, 1940.

In Germany the patent was scarcely taken notice of, or wrong conclusions were drawn from it. For instance, it was assumed that the asymmetry was due to a desire to spread the mass along the span and thus to reduce the bending moment in the wing Last year in England the journal *Flight* published the patent, together with a further variation of English origin. This latter publication also missed the main point of the idea.

The Prototype

The German Air Ministry intended in the year 1937 to have an aircraft built for special purposes. From manufacturing and tactical considerations the specification laid down the type, single-engined, to be developed. The best possible view was demanded, provided it could be combined with these fundamental requirements.

From the beginning of tackling the problem it was clear to me that the view demanded could not be provided in the conventional single-engined type of aircraft. The most favourable observation post was occupied by the engine, and all other look-out posts above and below the fuselage, in the form of transparent excrescences, afforded only a feeble addition to the fields of view.

Again and again my thoughts returned to the "greenhouse" in the fuselage of a twin-engined aircraft, until the imagination made a daring landing on the idea of taking away one engine from a twin-engined aircraft, an arrangement which might be grotesquely explained as a single-engined twin-engine aircraft. In that way the asymmetrical aircraft was born.

One thing was clear at once: the efficiency was greater than that of the single-engined flight of a twin-engined aircraft, in which the drag of the stopped engine on one side has to be overcome by the thrust of the running airscrew on the other side.

A certain amount of guidance towards a useful solution was provided by the fact that from experience one knew that it was not immaterial on which of the two engines of a twin-engined aircraft one had to fly. This led to a consideration of the thrust and slipstream and their reaction until the result stood out clearly in my mind.

Thrust and slipstream reaction are in fundamental relation to one another. When the unsymmetrical thrust is greatest the slipstream reaction is also the greatest. It therefore follows that the asymmetry should be so arranged that these fundamental relations are utilised to cancel out. This was very easily arranged via the vertical tail surfaces lying in the slipstream.

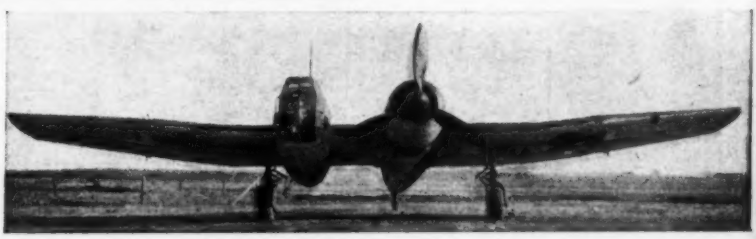
Thus when, as is customary in Germany, a right-hand tractor airscrew is used, it is best to place the engine on the left and the cabin containing the crew on the right side of the common centre line. The airscrew on the left turns the aircraft to the right. The slipstream strikes the fin at a certain angle from the left and so turns the aircraft to the left, thus compensating the asymmetrical thrust.

Swing Reduced

A short calculation indicated that this type of compensation would be likely to give satisfactory results, and would at any rate be better than the conditions which have to be taken into account in a powerful single-engined type, such as a fighter. This estimate has been confirmed by actual tests. The powerful swing met with in single-engined aircraft in changing over from horizontal to climbing flight was encountered in a very modest way only in the aircraft which looked asymmetrical to the eye. One may, therefore, with a certain degree of truth, make the apparently grotesque assertion that the symmetry of a lop-sided aircraft is greater than that of the conventional single-engined aircraft.

By shifting the centre of gravity spanwise from the centre of the aircraft, the torque reaction on the airscrew can also be balanced. In symmetrical aircraft this moment is, as is known, taken care of by trimming the aileron.

In the specification of the German Air Ministry mentioned above the firm of Blohm and Voss was not originally consulted. It is a testimony to the



The upper picture shows the original machine, which had a BMW 132 engine of 800 h.p. for take-off. The lower illustrates the production type, which is fitted with the BMW 801 engine. The performance figures on the next page refer to the original machine.

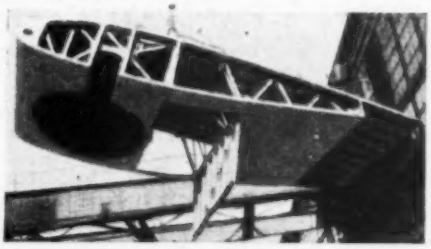
THE B.V. 141

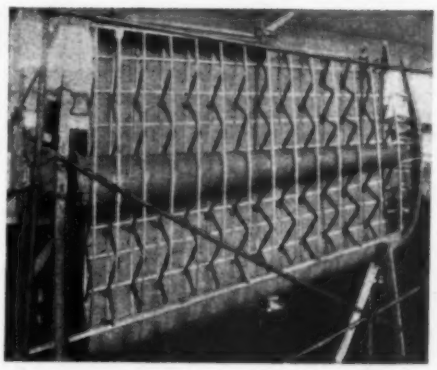
determination of the late Gen. Udet that he at once appreciated the possibilities in the new development suggested. As no one could assume that it would be possible to build such a peculiar type quickly, that is without considerable modifications, the usual requirements concerning urgency were waived.

It is one of the prettiest and, in aircraft construction, one of the most rare triumphs of technical thought that we were able to begin test flights one year after receiving instructions to build the machine; a few weeks later we could hand it over to the authorities for testing. All our guesses proved right, and special troubles with reference to the asymmetry were not encountered. From the performance point of view all who had to compare the machine with conventional development were surprised.

The flying characteristics of the type were so satisfactory that General Udet was able straight away to make rolls, loops and other evolutions.

Perhaps it might be interesting, in this connection, to make comparison with the contemporary English type in which also excellent view was aimed at: the Lysander. This machine had approximately the same engine power but was of smaller dimensions, and only a two-seater but without the greenhouse of our BV 141.





Structural details of the BV 141. In the upper photograph the shell of the inner wing portion is shown without the single tubular spar. This, however, is in place in the lower picture of the outer wing portion in its assembly jig.

Lysander and BV 141 Compared

	Lysander		BV 141 A	
	kg.	lb.	kg.	lb.
Airframe	1,055	2,320	1,640	3,600
Power plant	785	1,730	1,030*	2,268
Crew	200	440	300	660
Fuel	330	726	400	880
Useful load	310	684	460	1,012
Loaded weight ..	2,680	5,900	3,830	8,420

Speed at 3,500 m.—
(11,500ft.) 368 km./h. (228 m.p.h.) 388 km./h. (241 m.p.h.)
Initial rate of climb—
8.4 m./sec. (1,650 ft./min.) 9,5 m./sec. (1,860 ft./min.)

*This figure includes self-sealing tanks; the Lysander did not have these.

The Lysander has a wing area of 24 sq. m. (258 sq. ft.); the BV 141 43 sq. m. (463 sq. ft.). Lysander wing loading 22.9 lb./sq. ft.; BV 141 wing loading 18.2 lb./sq. ft.

These figures show the superiority of the asymmetrical aircraft.

During further tests certain new information came to light from the point of view of armament and operational considerations. The view and field of fire from the tail end of the nacelle were exceptional. The interruption by the top-sided fuselage was more than made up for by the free field of fire through the most dangerous defence sectors. In this connection it should not be forgotten that turning of the aircraft around the longitudinal axis, that is rolling, is one of the most easily executed tactical manœuvres, since neither direction nor height has to be changed. (In order to bring the attacker into the field of fire.—ED.)

An attack from the side blanketed by the fuselage can therefore be defended much more easily than an attack from the blind spot caused by the tail in conventional tail defence.

However, in the course of our tests we went a step farther and cut away the right tailplane, which projected into the field of fire from the tail of the nacelle, and thus obtained a further improvement. It was a very pleasant experience to find a combination of effects which not only improved the field of fire but the stability. We found it possible to retain the same stability without increasing the tailplane on the left to compensate for that cut off on the right.

It is even possible to use this experience in normal single-engined aircraft by using an unsymmetrical tail so as to get it partly out of the slipstream.

More Power

When the experiments had been concluded we received an order to develop a new aircraft type the BV 141B, to take the more powerful engine, the BMW 801, needed to fulfil the requirements that had grown more severe in the meantime. With this new type a considerably increased performance was attained, a fact which increased the possibility of using the machine operationally on special duties

As regards the design, the following may be mentioned. Since the general problems had already resulted in a radically new solution, it will be appreciated that in the narrower problem of view, etc., everything was done, in the way of shapes and components, transparent coverings, equipment and armament, to facilitate the work of the observer in accordance with all the latest ideas. The observer sits on the right, by the side of the pilot, and has ample room to move; his seat is adjustable fore and aft, and his equipment is placed within easy reach around him.

The fuselage is built as a stressed-skin shell right back to the tail. As there are no uncovered cut-outs, it has proved very stiff in spite of its low weight. The wing shows the single tubular spar familiar from all B. and V. aircraft. With the numerous wing cut-outs in this machine (two fuselage cut-outs and two for the undercarriage) the tubular spar has proved a reliable structure member In the construction of the wing an interesting innovation has been introduced. The whole wing profile, with the exception of a strip on the underside for the insertion of the tubular spar, is manufactured as a finished unit. This facilitates assembly in quantity production as well as replacement in case of damage.

Control Surfaces

Ailerons are fitted on the outer wing portions only; they have inset aerodynamic balances, and are also carefully mass-balanced. On the inner wing portions are mounted simple split landing flaps, which are hydraulically operated.

The asymmetrical tail is carried on a "neck" growing from the fuselage. On the projecting side the tail is braced by a single strut. The centrally placed fin and rudder are continued downwards as far as possible so as to bring a large area into the airscrew slipstream.

An undercarriage of very wide track is used in order to give good control on the ground (the offset thrust being balanced by a strong braking moment in opposite direction). In any case this swing only arises on rare occasions,

(*Continued at foot of next page.*)

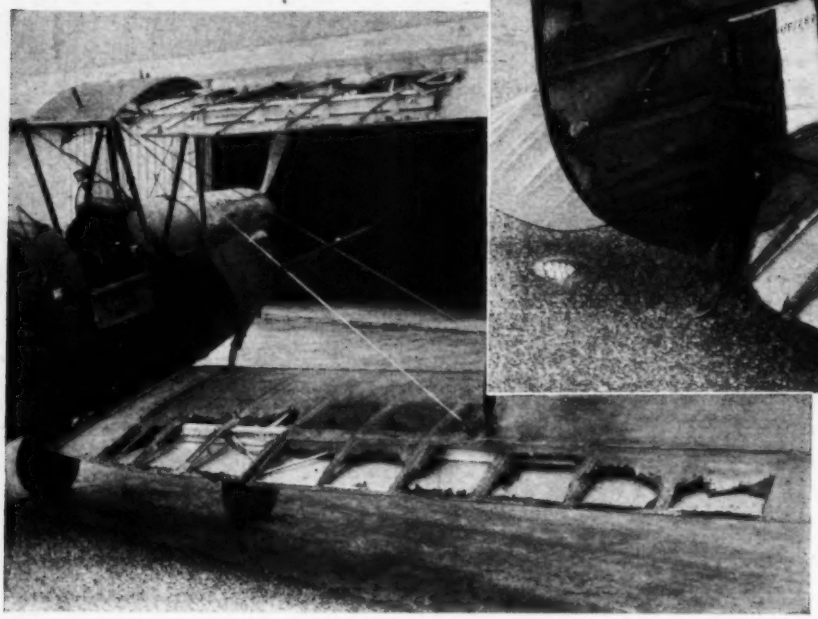
ADVENTURE of a TIGER MOTH

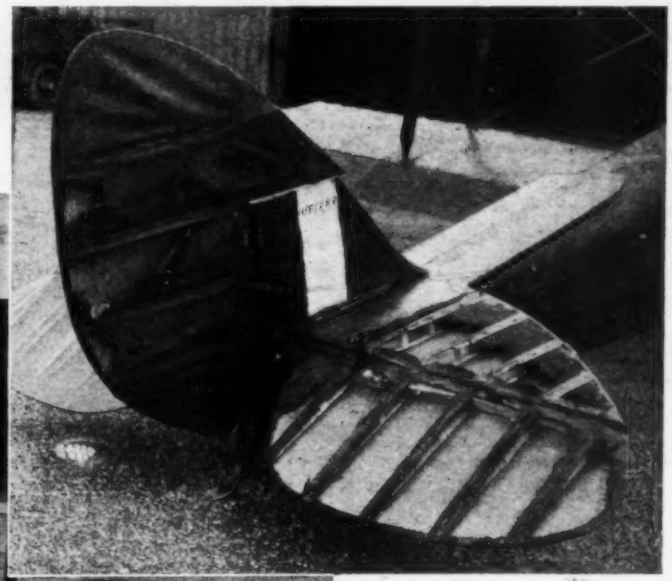
Trainer Hits Barrage Balloon and Catches Fire

AT week-end flying meetings before the war we were frequently treated to a display of balloon bursting as a form of amusement. This wartime balloon bursting is, however, not so amusing. A D.H. Tiger Moth, belonging to a Flying Training School, left its airfield in order to carry out manœuvres over a nearby "low flying area." Whilst the instructor and pupil were busily engaged, bad weather came down leaving a ceiling of less than 200ft.

Between the low flying area and the home airfield was a range of hills, and the machine had to climb into the cloud to go over these. Whilst still flying blind, the machine struck the top of a barrage balloon, just tipping the envelope with wheels and airscrew, which ripped the envelope, causing the gas to rush out and ignite on the exhaust of the training plane. The machine was almost immediately a mass of flames on one side and the pilot dived steeply, side slipping to the left to hold the flames away from the fuselage and the petrol tank.

Fortunately his dive put the flames out, although not before a considerable amount of the fabric was burned away from the top and bottom plane, tailplane and rudder. The instructor then flew the Tiger on to make a safe landing at his base.





It seems almost incredible that a structure of fabric and wood could survive such an experience as is recounted above. These photographs show the condition of the tail and starboard wing as the machine landed. The fire on the top plane was actually touching the side walls of the centre section fuel tank.

THE B. V. 141

(*Continued from page 65*)

such as starting from rest in a following wind. As soon as the slipstream strikes the tail, conditions are normal and the machine easily controlled. The undercarriage strut is hinged to a strong fitting anchored to the tubular spar. It is raised outwards, with its wheel, and disappears into an opening in the wing in front of the spar.

In conclusion it may be said that the expectations we had of the asymmetrical aircraft have been fully and completely fulfilled. In conjunction with the structural methods adopted a type of aircraft has been produced having a performance that might have been achieved in a conventional solution of the problem by waiving certain fundamental requirements, but for the same view and field of fire it could not have been a single-engined aircraft.

[We might make it clear here that, so far as *Flight* is concerned, there is a fundamental difference between the type of "lop-sided" aircraft first suggested to us by a R.A.F. officer and Herr Vogt's actual machine. The former was for the purpose of saving drag in a twin-engined aircraft; in the latter the official specification called for a single-engined type with good view.—ED.]

LONDON AEROPLANE CLUB

THE 16th annual general meeting of the directors of the London Aeroplane Club was held on July 4. Major K. M. Beaumont, D.S.O., was in the chair, and Messrs. F. T. Hearle, W. E. Nixon, F. E. N. St. Barbe and Commander H. E. Perrin were present. The chairman moved the adoption of the revenue account and balance sheet for the year ended September 30, 1941. This was seconded by Mr. W. E. Nixon and carried unanimously.

In the course of his address the chairman expressed satisfaction with the position of the club's finances, which, he said, would be a most valuable factor when the time came to renew the activities suspended on account of the war.

He referred to the excellent work which the club's instructors are doing for the training of war pilots, etc., and to the many letters which he, Commander Perrin and others have received from members of the club now widely scattered in various parts of the world.

Mr. F. T. Hearle was unanimously re-elected a director, and Messrs. Bevis Walker and Company were unanimously re-elected auditors.

AWKWARDLY shaped panels can be formed quickly by means of the Drop Hammer. Parachute seats, wing tips, petrol tank ends, engine cowlings, wheel spats, exhaust pipes and a vast range of similar items.

When you are planning ahead for post war production remember that the General Aircraft Limited system of Drop Hammer pressing will contribute in a large measure to the wings of tomorrow.

For the present our shops are working to capacity, but we are still glad to give advice on all Drop Hammer work, and we can still make dies for customers' own Hammers.

DROP HAMMER

DIES & PRESSINGS

WINGS ARE THE WHEELS OF TO-MORROW

H 65

GENERAL AIRCRAFT LIMITED *Enquiries to* :- Sales Dept., London Air Park, Feltham, Middlesex.

Overseas enquiries to our Export Division :— ENGINEERING & AVIATION EXPORTS LIMITED, 50, PALL MALL, LONDON, S.W.1. Telephone: Abbey 6210.

Sixth of the New Recognition Series

AIRCRAFT TYPES AND H

Focke-Wulf Fw.190 and Me.109F

WHEN the first reports filtered through about the new German fighter, some surprise was occasioned at its being equipped with an air-cooled radial engine instead of the well-tried Mercedes-Benz in-line engine. Experience as between our own Merlin-engined fighters with their well streamlined noses and the radial-engined American types imparting a "blunt entry" to the fuselage, suggested that the Fw.190 might not be any improvement on the Messerschmitt, and that considerations quite divorced from performance had dictated its design.

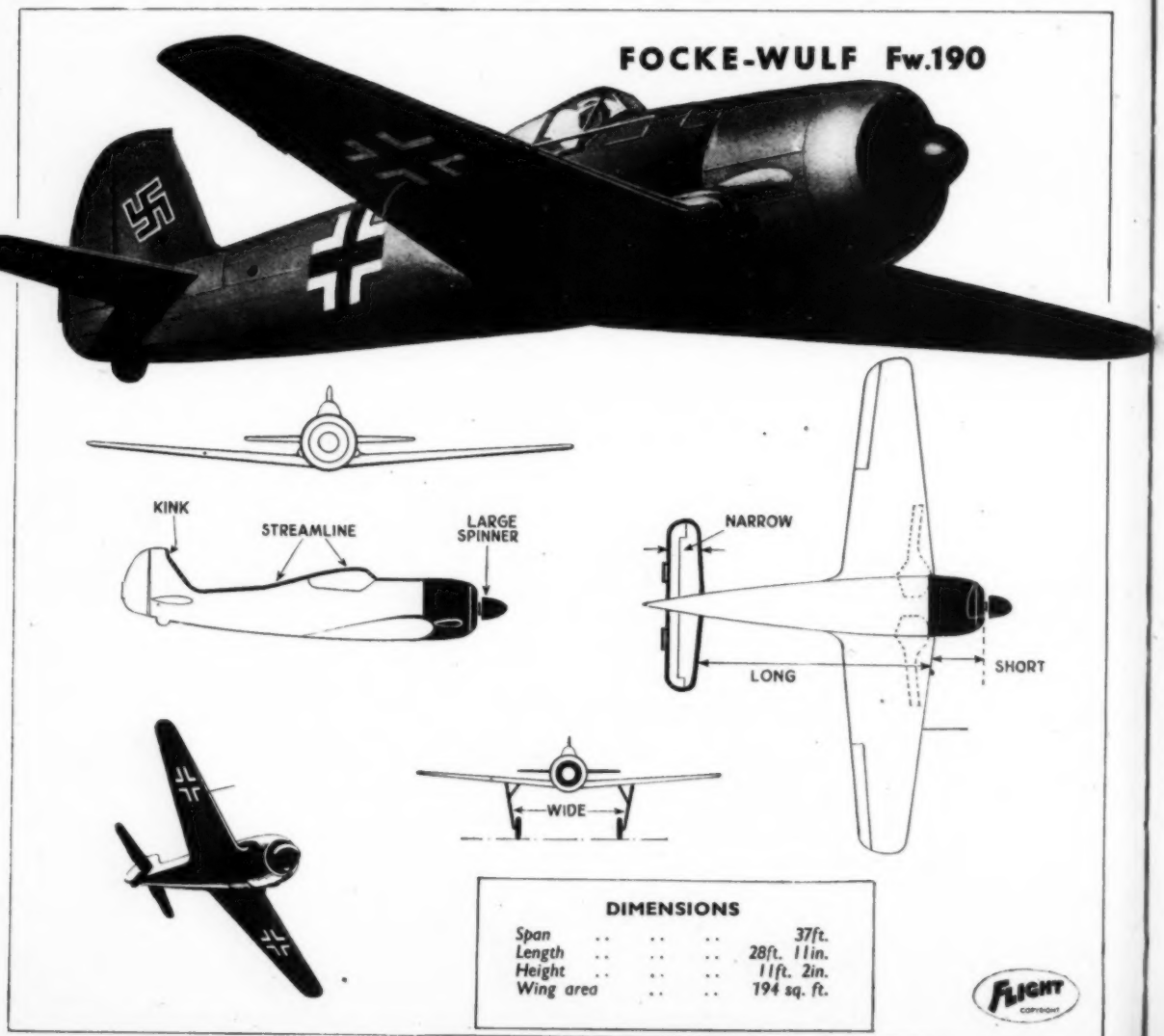
Actually, however, the Fw.190 is, from the design point of view, a very attractive aircraft, and certainly about the cleanest aerodynamically that Germany has evolved in the form of single-seater fighters.

This has not been entirely a case of designing a fighter aircraft to which the most readily obtainable engine could be fitted in order to speed up production. It is clear on examining the machine that its designer, Kurt Tank, has taken the 14-cylinder two-row radial B.M.W.801 engine as the keystone of his layout, and based his design upon this undeniably excellent power-unit which develops not less than 1,580 h.p. at 2,700 r.p.m. for take-off.

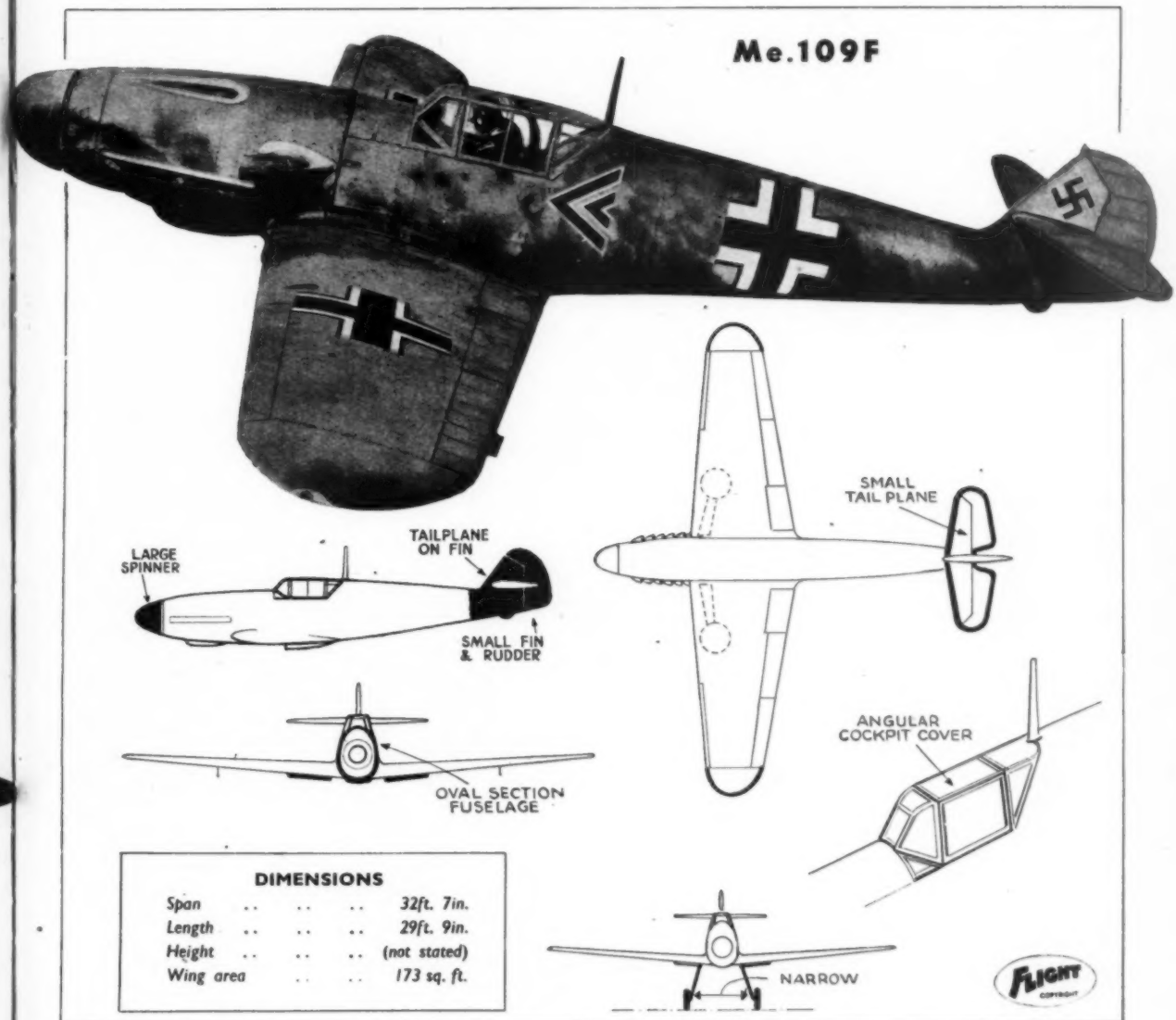
Features of this engine are its fan-assisted cooling, the sliding leading-edge of the cowling which controls the passage of air to the oil coolers, and the servo control unit which links the various components to the pilot's throttle. Nevertheless, it may reasonably be assumed (as has previously been suggested in *Flight*) that, had Germany possessed an in-line engine capable of a power output demanded by the modern fighter and comparable with that of the B.M.W., it would probably have been chosen in preference to the radial type.

Having chosen the B.M.W., however, the Focke-Wulf designer has attached a very compact aircraft to it, and has paid attention to good manœuvrability. The forward position of the wings, the leading-edge of which abuts on to the engine cowling, indicates that the major weight of engine, tanks and pilot has been compressed within the smallest possible volume. Other notable features are the small, well-faired cockpit cover and the particularly wide undercarriage, making for maximum stability when the aircraft is obliged to operate from the rough surfaces of temporary airfields.

No precise information about its armament is available.



HEIR CHARACTERISTICS



DIMENSIONS

Span	*32ft. 7in.*
Length	*29ft. 9in.*
Height	*(not stated)*
Wing area	*173 sq. ft.*

THE main specification of the Messerschmitt Me.109F is very much the same as for the original Me.109E, of which it is a development. As far as external appearances go, the chief changes concern wings and tail mounting. The 109F has a slightly greater span and rounded tips, but the chord has been reduced and the area is a little less, thus increasing the wing-loading somewhat. The tailplane of the 109F is of cantilever construction instead of the externally braced type fitted to its predecessor and is mounted near the base of the fin.

Improved performance in terms of speed, climb, ceiling and manœuvrability at high altitudes has been the object in the Me.109F, and to this end a more powerful engine has been employed and all armament kept within the confines of the fuselage.

The engine is the Mercedes-Benz DB-601N, which differs chiefly from the DB601A fitted to the Me.109E in having flat-topped pistons instead of concave. This raises the compression ratio from 6.9 to 7.9 and steps up the power output by some 6 per cent. at all altitudes. With this hotted-up version of Germany's most successful inverted V-12 liquid-cooled engine, the top speed of the Me.109F is said to have been pushed up to 380 m.p.h. at 21,000ft. and its ceiling to 40,000ft.

The process of relieving the aircraft of the outboard weight of wing guns has necessarily entailed a reduction in their number, but it is based on the theory that if you can out-manœuvre your enemy (at the higher altitudes) the number of guns you can bring to bear on him becomes of secondary importance, especially if the *rate* of fire can be increased.

Acting on this assumption, Willy Messerschmitt has equipped the Me.109F with a rapid-firing 15 mm. Mauser cannon mounted between the cylinder banks and firing through the hollow hub of the airscrew. This gun, incidentally, is electrically cocked and fired, and is belt-fed from an ammunition box in the starboard wing. Its rate of fire is no less than 900 rounds per minute, which is a big improvement on earlier types. Then, in addition to its Mauser cannon, the Me.109F mounts a pair of 7.9 mm. machine-guns immediately above the engine and synchronised to fire through the airscrew disc.

AIRSPEED OXFORD

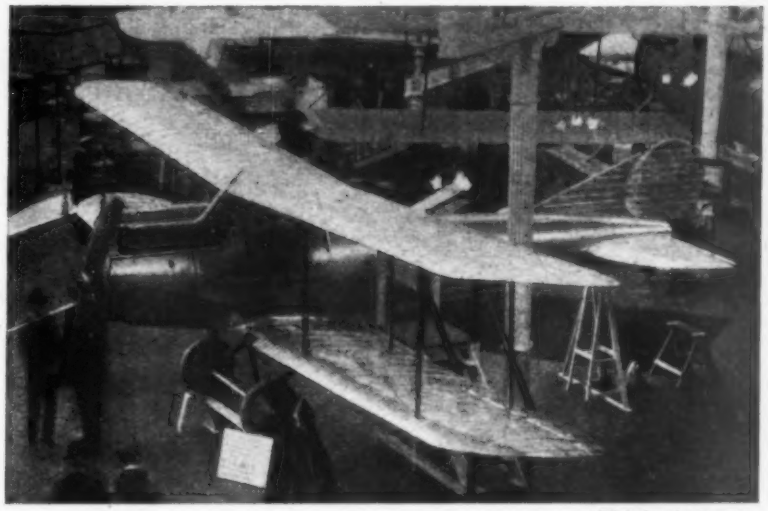
advanced twin-engined trainer

AHEAD OF THEIR TIME—6

METAL CONSTRUCTION of TWENTY YEARS AGO

Inadequately Appreciated Pioneer Work of Famous British Firm : The Short "Silver Streak" of 1920

By THE EDITOR



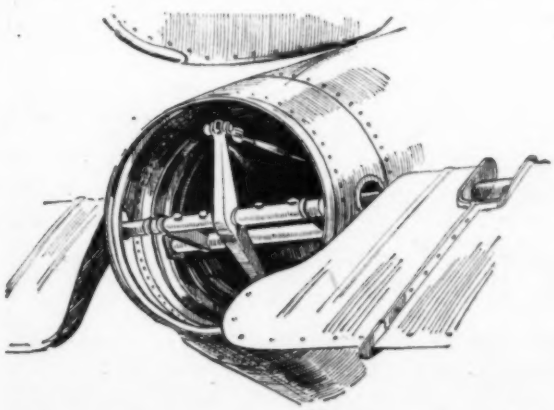
"*Flight*" photograph.

Metal-clad and stressed-skin construction in 1920. The Short *Silver Streak* at the Olympia Aero Show. The wings as well as the fuselage had duralumin covering. The engine was a six-cylinder in-line water-cooled Siddeley Puma.

PROBABLY if an assembly of people, even one greatly interested in flying, were asked who laid the foundations for the modern all-metal, stressed-skin type of construction, 90 per cent. would answer, "Hugo Junkers." They would be only partly correct, for although Professor Junkers was probably the first to produce an aircraft in which every component of the structure was of metal, the fundamental Junkers design is not perpetuated in modern types. The reason is not far to seek. The Junkers scheme was based upon metal-clad rather than stressed-skin construction. By that I mean that, although his early aircraft were certainly covered with sheet metal, the covering took no very great part in bearing the loads.

The early Junkers monoplanes had wings in which a multiplicity of tubular spars were tied together by crinkled strips riveted to the spar tubes. That was the main structure. All the wing covering did was to form the wing section, as the corrugations ran fore and aft, and so virtually took the place of the more orthodox wing ribs. Similarly with the fuselage covering; the skin was stiffened by longitudinal corrugations, but there was a fair amount of internal structure. Altogether corrugations were the trade mark of the Junkers concern for many years, and I remember that when the first of his machines visited this country one of the onlookers remarked that it looked as if it had been constructed of corrugated iron fencing.

As speeds of aircraft increased, these external corrugations could no longer be tolerated, and that system of construction has not survived; it has given place to the smooth metal covering, and in the development of this the Junkers company cannot claim to have taken a leading part. Often the British are accused of being slow to evolve novel ideas. While that may be true generally, it does not apply to stressed-skin metal construction, in which credit may rightly be claimed by us for having been in the field very early. That the system was not officially approved at once is no fault of those who originated it. The fact remains that it was presented in tangible form at the aero show held at Olympia, London, in 1920.



Details of elevator mounting and construction on the Short *Silver Streak*. In those days it was not customary to "bury" the elevator cranks.

"The Governor" Insisted

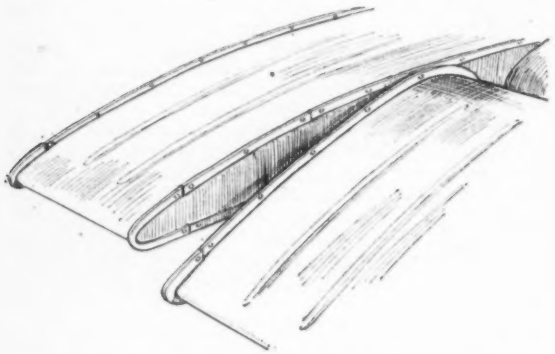
I remember seeing at Rochester some time during 1919 a test specimen of a rear fuselage portion. Mr. Oswald Short had conceived the idea that an aircraft fuselage might be made as a very simple thin metal shell. I do not think that at first his technical staff were very enthusiastic, but "The Governor," as they called him, was persistent, and a test specimen was rigged up. If I remember rightly, the first one had no internal stringers, and probably it failed under a somewhat disappointingly small load. But the work proceeded, and gradually a distribution of formers and stringers was evolved which did not compare too unfavourably with contemporary composite wood and metal structures. The result was a biplane shown at Olympia the next year. In its aerodynamic design it was not revolutionary, although it was certainly "cleaner" than the average. But its structure laid a foundation upon which succeeding generations, if I may so express it, have built up to the high standard of structural efficiency attained to-day.

To obtain a true appreciation of the foresight to which this early Short biplane bore witness, it is necessary to recall briefly the background against which it appeared;

METAL CONSTRUCTION OF TWENTY YEARS AGO

in other words, the types of design which surrounded it at the 1920 Olympia Aero Show. The most powerful engine of that day was the Rolls-Royce Condor of 600 h.p. Few aircraft were fitted with it, the majority being content with the more modest Siddeley Puma of 250 h.p. or the Rolls-Royce Eagle VIII of 360 h.p., and a few having the 450 h.p. Napier Lion.

There were great hopes of a boom in civil aviation, and many firms exhibited their attempts at interpreting future demands. The war was over, and the thoughts of all turned naturally to civil flying. In the main the civil types shown were "civilised" versions of military types, although a few cabin machines appeared. Among the commercial types were two triplanes. There was not a single monoplane on view! Construction was that usual

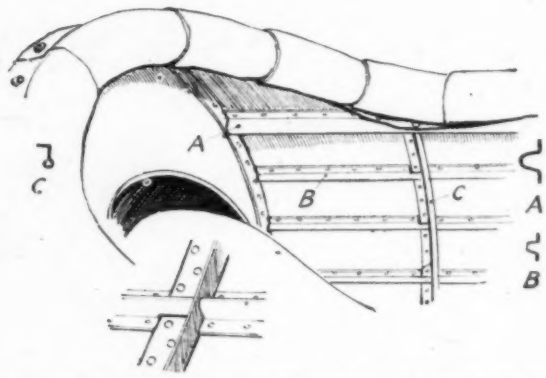


The manner of turning over the edge of the tailplane covering at the tip is shown on the left. On the right is a portion of fixed wing and an aileron. The covering was in the form of panels, with bent-up edges running chordwise. These edges were covered by U-section capping strips, and the free edges of the flat-plate ribs were locked between them by rivets. Between the ribs the covering was fluted at intervals for stiffness.

for the time: wooden structure members with steel fittings and R.A.F. wire bracing.

It was in such surroundings that the Short all-metal machine appeared. At first it was known as the *Swallow*, but later changes resulted in the *Silver Streak*, and it is under the latter name that I propose to place it among aircraft which were ahead of their time.

One might have thought that the *Silver Streak* would have caused something like a sensation. Well, it didn't.



The fuselage of the *Silver Streak* was a stressed-skin structure with stringers of V-section and formers of L-section, the free edge of the L being rolled, as shown. That was very advanced construction in 1920.

That it was clever was generally admitted, but there was much shaking of heads. The wing covering was extremely thin (I forget the exact gauge, but it was certainly thicker than the strip steel which later came into use for structure members), and there was the rather unknown risk of corrosion, known to exist but the true facts of which had not been verified.

I well remember discussing the matter with Mr. Oswald Short. Always very level-headed, he admitted that duralumin would corrode, but, he said, "why be so afraid of that? Corrosion has been with us ever since we started building structures, only we call it rust and are not afraid of it." And there was a great deal of truth in that. But he found it very difficult to convince the authorities, and during the next few years he wore hollows in the steps of the Air Ministry in his fight to get stressed-skin construction recognised. Ultimately he succeeded, but a less determined man might well have given up the attempt and rested content with giving the Air Ministry the same old girder type of construction which had served us ever since we began to fly. Oswald Short has never had his due recognition for that pioneer work, nor for much that followed it.

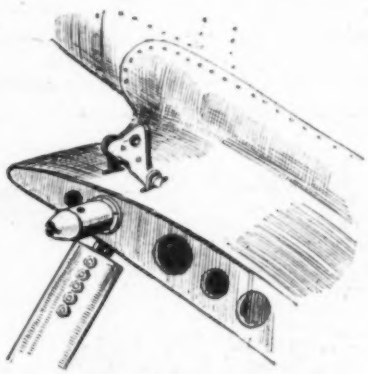
But, to return to the *Silver Streak*, I find that in *Flight*, of July 22nd, 1920, I wrote: "It goes without saying that the Short all-metal machine is not only the most interesting on this stand, but the feature of the show.

The Short *Silver Streak* of 1920. In addition to being of all-metal construction the machine was of very neat outline.

METAL CONSTRUCTION OF TWENTY YEARS AGO

This is the first time in the history of aviation that a British machine built of metal throughout, even to the wing covering, has been exhibited. It is, moreover, the first time an all-duralumin—or practically so—aircraft has been built in this country." The exception to the all-duralumin construction was formed by the main wing spars, which were steel tubes of circular section.

The wing construction was interesting mainly on account of the secondary structure. The primary structure, with its steel spars, streamline interplane struts and lenticular-section bracing wires, was fairly orthodox. But the covering was the remarkable feature. It was in the form of thin sheet duralumin panels running from leading edge to trailing edge. The lateral edges of these panels were turned-up, and between the lips of adjacent panels were sandwiched the edges of the main wing ribs, which were plain sheet metal. A capping strip of U-section was placed over these edges, and rivets held panel edges, rib edges and capping strips together.



Wing root fillets are thought of as modern "inventions." Here is one on the lower wing of the Short *Silver Streak* of 1920.

For a biplane wing it is difficult to imagine a simpler method of using sheet metal for the covering. The wing section was, of course, too thin to make stressed-skin construction feasible, and this was the nearest approach that could be made within reasonable weight limits. I am not going to argue that it was as light as doped fabric covering, nor did the designers claim that it was, but it was a step in the right direction. The very thin sheet metal used would have buckled fairly easily, and to reduce that tendency chordwise fluting fairly widely spaced (two between each set of turned-up panel edges, if I remember correctly) was used. Purely from a weight point of view, there is little doubt that the designers went too far by using the same type of covering for the control surfaces. I have no doubt that fabric-covered surfaces would have been lighter, but that would have meant departing from Oswald Short's ideal.

Laying a Foundation

It was, however, in the construction of the fuselage that the greatest progress was to be found. Whereas the type of wing construction was not perpetuated, the fuselage structure quite definitely laid the foundation for stressed-skin construction as we know it to-day. All the main features were there: transverse rings or formers of I-section, longitudinal stiffeners or stringers of V-section, and the covering panels riveted to formers and stringers.

The transverse formers were there from the very beginning, of course; the fuselage could have no shape without them. But in the original test specimens which I saw at Rochester there were no stringers, and if I am not mistaken the first all-metal flying boat hull built by Short's (it was for the biplane superstructure of an F-boat) had very few stringers. Later it was found that the gauge of sheet covering necessary to prevent the formation of shear wrinkles was excessive, and stringers were introduced in the boats. However, Short's remained true to their first ideal, in that where stringers and formers intersected it was always the stringers which were cut in preference to notching the formers.

To give some idea of the simplicity of the fuselage of the *Silver Streak*, I reproduce herewith some sketches from *Flight*, of July 22, 1920. It will be observed that if there has been development in stressed-skin construction there has also been progress in the skill of our artists!

One may ask what it was that put Oswald Short on to the idea of sheet-metal construction. Most likely it was the experience which Short's had of airship construction. During the war 1914-18, Short Brothers built large rigid airships at Cardington, Bedfordshire. The first was of wood construction, but later ships were of metal. Mr. C. P. T. Lipscomb, who has recently been made a director of the company, and who has been chief designer for a number of years, was in charge at Bedford, and it was probably there that he acquired the art of stiffening sheets of thin metal with strips formed into sections. Even the stabilising of free edges by rolling them over was not only foreseen, but actually used in the *Silver Streak* of 1920. It may all seem very obvious now, but twenty-two years ago our knowledge of this form of construction was extremely limited, and practical experience even more so.

I have forgotten how these sections were formed at the Rochester works in 1920. But some years later, when large aircraft were built and strip construction became the fashion, I remember seeing what must have been the least expensive of all forming tools: the press on which spar flanges were formed. It was nothing more than a long bench on which the female die was a wooden plank gouged out (no pun intended!) to the desired shape, the male part being a similar plank gouged in the opposite sense and attached to the feet of screw jacks above the other. The screw of each jack terminated in a large handwheel, and forming the strip was done by placing the flat blank on top of the lower die and screwing down the row of jacks by hand! Primitive, but it worked; and cheap when "one-off" was the rule rather than the exception.

Even a Metal Airscrew

After this little digression I may conclude by pointing out that the all-metal feature of the "Silver Streak" was not confined to the airframe. Even the airscrew was of metal. I frankly confess that I do not remember details, but I find that in the issue already quoted I said: "The airscrew is an aluminium casting faced with duralumin." After all these years I cannot remember what I meant by that expression, but I do recollect seeing at Rochester later a metal airscrew made from a duralumin "plank" twisted to give the desired pitch, and mounted by shaped metal hub blocks front and back.

When admiring the sleek appearance of modern aircraft, with their flush-riveted smooth skins, wing fillets and buried control crank levers, it is well to remember that all this had its beginnings in the Short *Silver Streak* of 1920.

C. M. P.

The Late Commander Sir Walter Windham

COMMANDER SIR WALTER WINDHAM, who died at Tyrcelyn, Builth Wells, on July 5th, at the age of 74, was among the most influential pioneers of British flying.

He founded the Aeroplane Club in 1908 and controlled the air meeting at Doncaster in October, 1909, which, with the Blackpool meeting held simultaneously, was the first in Great Britain. The following year he took part in the meeting at Bournemouth and won a prize with a machine built by himself.

He it was, also, who offered a gold cup to the first airman to fly the English Channel, won by Louis Bleriot in 1909, and in 1911 founded the first two official air mail services on record, one in India and the other between Hendon and Windsor.

Knighted in 1923, Sir Walter had served in the Royal Navy, the Royal Indian Marines and the Royal Naval Reserve.

JAPAN'S POWER UNITS

Review of Developments Prior to Outbreak of War

By HARUO YOSHIKAWA, Captain, Jap. Navy, Berlin

(From an article in the German periodical "Luftwissen")

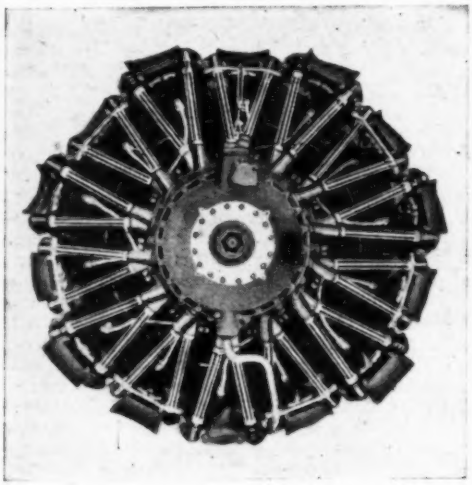
A DESCRIPTION of the development and the present state of the Japanese aircraft engine production appears to be of special interest to-day, when the brave deeds of Japan's forces in Eastern Asia have proved the remarkable progress of the Japanese automotive industry.

The author has lived for the last three years in Germany, and can only report on the development up to that period. A Japanese proverb says, "Future can be judged by the past"; the description of the past development will, therefore, hint at the present conditions. It is in this light that the development of the Japanese aircraft engine production is being discussed below.

Initial Development

The author is a member of the Imperial Japanese Navy, and is, therefore, primarily acquainted with technical development of this service. Since this article is written mainly from memory, the reader is asked to forgive some unavoidable inaccuracies.

As in other spheres of modern technique, Japan's aircraft engine production was lagging behind the development in Europe and America. The machine tool industry and the automobile industry, which are considered to be the foundation of the aircraft engine construction, were not sufficiently developed in Japan. For this reason the aircraft engine industry was confronted with special difficulties. The history of the Japanese automotive industry, the products of which have proved to be in the top class, is a chain of ceaseless work which can be properly appreciated only by those who have taken part in it.

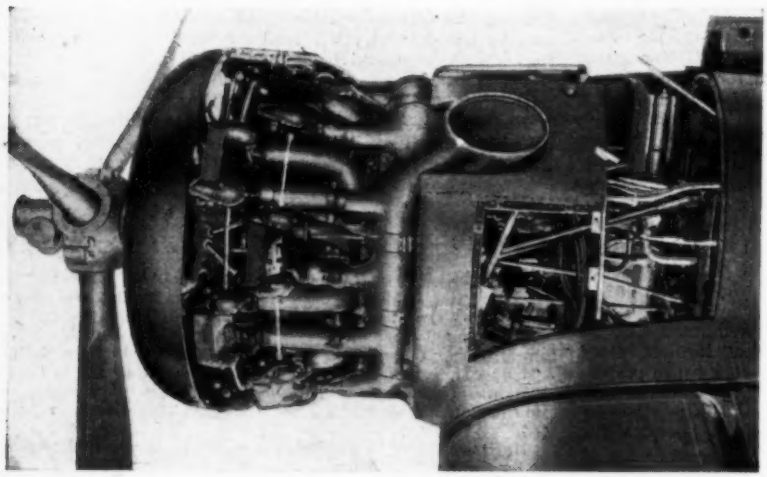


The "Kinsei" engine is an air-cooled 14-cylinder twin-row radial type with a rated power output of 990 h.p. at 2,400 r.p.m.

The Japanese Naval Air Force was created about 1912. To begin with, both training and maintenance were limited to the naval bases of Yokosuka in the vicinity of Tokyo. In 1918 an aircraft works for the navy was founded in Hiro in the neighbourhood of the base of Kure (Western Japan). Simultaneously a civil aircraft industry started to develop slowly. In the initial period, aircraft engines were of foreign manufacture. The first locally produced engine corresponded to the German Daimler motor, and was built in 1914 by the Military Armament Works.

As far as I can remember, the Imperial Japanese Navy had the first 12-cylinder V-engine constructed at the torpedo department of the naval shipyards at Kure in 1917. This engine was modelled after the English Sunbeam. The personnel which participated in this construction was subsequently transferred to the engine works at Hiro. The construction of torpedoes was, therefore, here the foundation for the production of aircraft engines. The tremendous successes achieved by Japan's Air Arm in their recent operations with torpedoes are now well known.

Until 1930 aircraft engines produced in Japan were mainly based on licences of foreign origin. As late as 1937 some engines continued to be manufactured on this basis.



Another view of the "Kinsei" engine for which great reliability is claimed. It has been installed in long range bombers Type 96, which have been widely used by Japan against China.

The Policy of Emulation

Below are a few details of such Japanese versions of foreign engine types:—

(All data refer to rated performance if not otherwise stated.) (1) Radial engine, water-cooled, 230 h.p. French Salmson (Military Works 1919 to 1927). (2) Radial engine, air-cooled 80, 110, 120 h.p. French Gnome-Rhone (Tokyo Gas-denki, Ltd., the present Hitachi-Aircraft Works, Ltd.). (3) In-line engine, water-cooled 100 and 130 h.p. German Daimler-Benz (Military and Naval Works and Tokyo-Gas-denki, Ltd.). (4) V-engine, 12-cylinder, water-cooled, 400 h.p., and (5) A water-cooled 450 h.p. engine, both French Lorraine

JAPAN'S POWER UNITS

(Marine Works, Nakajima Aircraft Works and Aichi Tokei-Denki, Ltd.). (6) In-line engine, water-cooled, B.M.W. VI (from 1925 to 1937) (Kawasaki shipyards, now Kawasaki Aircraft Works, Ltd.). (7) Radial engine, 9-cylinder, air-cooled, 460 h.p. Bristol Jupiter IV and VI (Nakajima Aircraft Works). (8) In-line engine, water-cooled Junkers (Mitsubishi Combustion Engines, Ltd., now Mitsubishi Aircraft Engine Works). (9) In-line engine, water-cooled, 90 deg. V-type 300 h.p. 8-cylinder, 60 deg., and a V-engine 450 and 600 h.p. 12-cylinder, French Hispano-Suiza (Mitsubishi Aircraft Engine Works).

About the original Japanese development one can say the following:—

Approximately from 1925 an engine designated Type 14 of 550 h.p. and of domestic design was in production by the Naval Works at Hiro. It was a 12-cylinder broad-arrow type, similar to the Lorraine which was produced in the same works. But the construction of the Type 14 was thoroughly original. It was a super-dimensional engine, which in 1928 reached an output of 750 h.p. and was produced for a twin-engine metal flying boat of the type 89, constructed in the same works.

From 1927 and onwards original designs of the local civilian aircraft industry came gradually into appearance. Of these, three engine types were most successful: the Tokio-Gasdenki Company (now Hichi) produced an air-cooled 7-cylinder radial "Kamikaze" (Divine Wind) of 130 h.p. and a 9-cylinder radial of 300 h.p. designated "Amakaze" (Heavenly Wind). These firms are also known as the producers of a small engine for training aircraft, the performance of which gradually rose from 150 to 350 h.p. These engines are still in employment.

A Jap Design

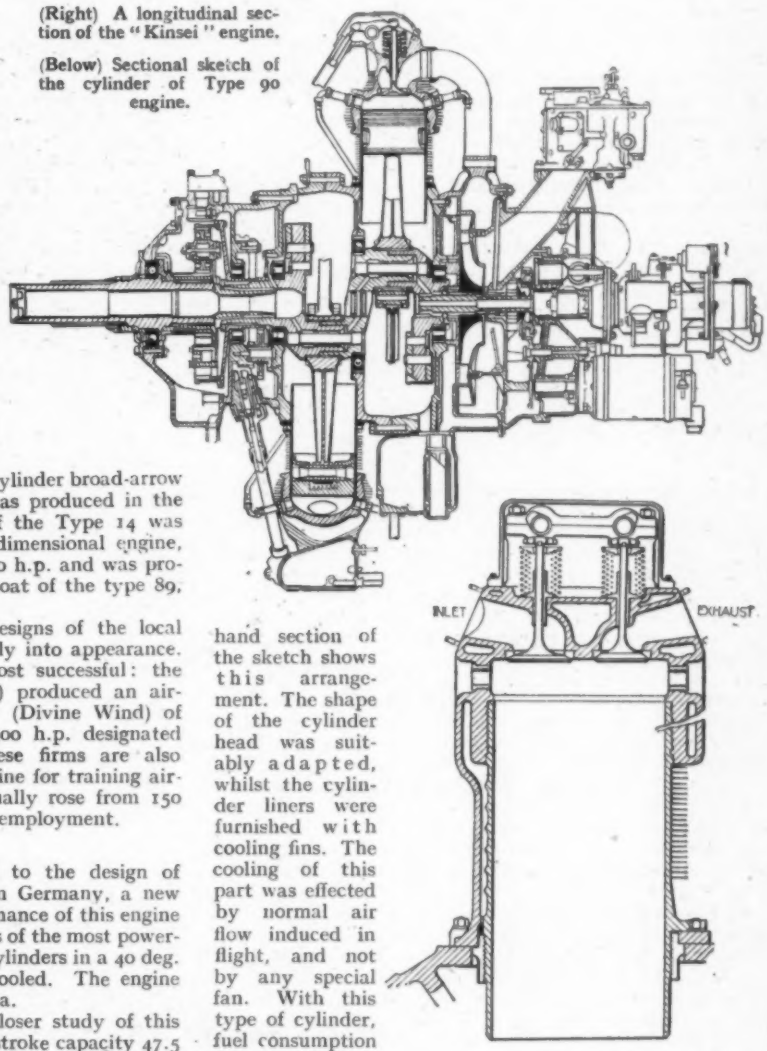
The Hiro Marine Works produced to the design of Saneyoshi, an engineer who studied in Germany, a new Type 90 engine. The maximum performance of this engine was 1,100 h.p., and was then in the class of the most powerful types. The engine was of eighteen cylinders in a 40 deg. broad-arrow arrangement, and water-cooled. The engine was characterised by a small frontal area.

The following data will provide a closer study of this type: Bore 145 mm., stroke 160 mm., stroke capacity 47.5 litres, dry weight 720 kg.

Interesting details are shown in the adjoining sketch. In the left half of the sketch, showing the liquid-cooled design, the wet steel cylinder liners are screwed into the light alloy cylinder head block, which is cast integrally with the coolant jacket. At the lower end a shouldered sleeve nut, screwing on the liner, stresses the jacket portion of the block in compression. The combustion pressure is transferred from the cylinder head to the upper end of the liner, and further by the shoulder of the sleeve nut to the jacket flange by which the block is attached to the crankcase.

For this reason it was possible to reduce the section of the jacket wall. As the attachment flange of the block is not stressed in tension, the required strength is obtained with a small expenditure of material. The water-jacket seal is effected in the usual way by means of a rubber ring. Externally, the liner is protected against corrosion by chromium plating. Water-cooling of the cylinder, and especially of the exhaust valves, has proved to be successful. Even with fuel of the quality available at that time it was possible to obtain a consumption of 200 g./h.p.

Interesting experiments were subsequently made with semi-air-cooled cylinders on the same engine. The right-hand section of the sketch shows this arrangement. The shape of the cylinder head was suitably adapted, whilst the cylinder liners were furnished with cooling fins. The cooling of this part was effected by normal air flow induced in flight, and not by any special fan. With this type of cylinder, fuel consumption was equal to that of the liquid-cooled version; the spacing of cylinders was considerably reduced, and consequently the weight and length of the engine cut down.* A comparison of the semi-liquid-cooled engine with the fully liquid-cooled version shows considerable simplification. The required liquid quantity is considerably reduced, and the dimensions of the radiator are reduced by approximately 50 per cent.



(Right) A longitudinal section of the "Kinsei" engine.

(Below) Sectional sketch of the cylinder of Type 90 engine.

Because of its low fuel consumption and high reliability, the Type 90 engine was widely used for a twin-engine flying boat and a twin-engine bomber, both for long-range employment. The engine was later improved by a supercharger, and reached a performance of 1,500 h.p. at a weight of 750 kg. This power output, however, was too high for aircraft produced at that time.

A smaller version of the Type 90 was an engine of 12 cylinders, broad-arrow arrangement. This type had a bore of 135 mm. and a stroke capacity of 27.5 litres. It appeared first in 1931 under the designation of Type 91, and had a rated power of 600 h.p. and a maximum power

*This is difficult to understand as the semi-air-cooled example has a coolant belt around the combustion area of the cylinder which is necessarily of the same diameter as on the liquid-cooled version.

JAPAN'S POWER UNITS

output of 750 h.p. The engine was installed in flying boats, sea reconnaissance aircraft with a crew of three, and in shipborne bombers.

Since in the course of further development sufficiently powered radial engines were produced, the production of liquid cooled in-line types gradually subsided in favour of the twin-row air-cooled radial.

The Nakajima Works produced in 1930 the "Kotobuki" (Congratulation), a 9-cylinder air-cooled radial of 460 h.p., which was mounted on shipborne fighters and two-seater reconnaissance aircraft.

Aircraft of the Army Air Force were frequently equipped with engines of domestic design and production. One of them was Type 92, a 9-cylinder air-cooled radial of 400 h.p., and Type 93, a liquid-cooled 12-cylinder V-type of 700 h.p., both built by Mitsubishi.

Local Products

Since 1933 high-performance aircraft of the armed forces were equipped with engines of local Japanese development. In 1935, that is, at the time of the renaissance of the German *Luftwaffe*, the performance of the above mentioned air-cooled radial "Kotobuki" reached 550 h.p. The Nakajima Works produced also a 9-cylinder air-cooled radial engine "Hikari" (The Splendour) of 700 h.p.

The Mitsubishi Works developed and produced a number of different air-cooled radial types. The following deserve special mention: "Miozio" (Bright Star), a 9-cylinder engine with a stroke capacity of 27.7 litres, weight of 480 kg., take-off power at 2,300 r.p.m. of 800 h.p., and a rated power at 900 m. altitude of 775 h.p. "Kinsei" (Golden Star), which is described below, and the "Shinten," a 14-cylinder type with a stroke capacity of 36.7 litres, a weight of 603 kg., and a power output of 1,000 h.p.

The Kawasaki Works developed a Type 95, a 12-cylinder water-cooled V-type of 800 h.p. At present only this firm is engaged on the production of liquid-cooled engines.

It may interest the reader to know that the designation of the above-mentioned engine types is always an abbreviation of the year of their production. Thus Type 95 indicates the year 2595 counted from the coronation of the first Japanese Emperor.

Of the engines described above, two have appeared in the skies of Europe. One was the "Kotobuki," which was installed in the "Kamikaze" (Divine Wind) aircraft of the Asahi Shimbun. The "Kamikaze" flew in 1937 from Tokyo to London in 100 hours. The aircraft then visited Berlin and returned to Japan via India.

The other one was the "Kinsei." This engine was installed in the "Nippon" aircraft, belonging to the Nichi-Nichi Shimbun newspaper, which flew from Japan across the Northern Pacific, North America, South America and the Southern Pacific and Africa to Europe; because of the outbreak of war, the aircraft could not reach Berlin and returned home from Rome via India.

Made in Japan

The "Kinsei" engine, shown in Figs. 2 and 4, was installed in a long-range bomber, Type 96, at the beginning of the Sino-Japanese conflict in 1937. These aircraft have been used for operations against Nanking and Shanghai, which involved the crossing of the China Sea during torrential storms. Since then, the Type 96 bomber has proved its worth in operations against China in all directions of the compass.

Below are the most important details of the Kinsei engine: 14-cylinder twin-row radial, air-cooled, bore 140 mm., stroke 150 mm., capacity 32.3 litres, compression ratio 1: 6.6; reduction gear ratio crankshaft airscrew 1.43:1; length 1,646 mm.; diameter 1,218 mm.; dry weight 545 kg.; take-off power at 2,500 r.p.m., 1,000 h.p., maximum power output at 2,500 r.p.m. and about 2 km. altitude 1,075 h.p.; rated power output 2,400 r.p.m. and 2.8 km. altitude 990 h.p. Fuel consumption (cruising) 210 g./h.p./h.; performance per litre 33.4 h.p./ltr.; weight per unit power 0.51 kg./h.p.

In the course of the past few years the development of the various engine types described above continued further. Thus in 1938 two engines based on the above design with the same performance but with a reduced diameter were produced for high-performance aircraft. One of these types, the "Zuisei" (The Holy Star) was built by the Mitsubishi firm, while the other named "Sakae" (Prosperity) was in production at the Nakajima Works. Both types were 14-cylinder twin-row, air-cooled radials, with a stroke capacity of 28 litres, a weight of 530 kg., and a take-off power of over 1,000 h.p. Rated power at an altitude of 2-5 k.m. (with a two-stage supercharger) was about 1,000 h.p.

Since a large twin-row radial engine of a stroke capacity of 45 litres is at present produced by a number of engine factories, it can be assumed that in the present war engines of a maximum performance of 1,500 to 1,800 h.p. are widely employed.

A reliable in-line air-cooled engine was designed and produced by the Ishikawazima-Shipyard Company.

As mentioned before, the air-cooled radial engines are especially suited to the requirements of the strategic position of the Japanese Empire. To achieve this, the design, construction and testing of engines had to produce performances which in certain respects placed Japan's automotive production at the top of to-day's technical development.

Not all branches of development have been so successful, however. Thus for years the liquid-cooled engine did not command a high reputation. The development of liquid-cooled engines remained, therefore, far behind that of air-cooled types. Until now only Type 98, a water-cooled in-line V-60 engine of 900 h.p. came into series production by the Kawasaki Works for the Army Air Force long-range bombers.

The Kawasaki and the Aichi companies have recently acquired licences from the Daimler-Benz firm. Experimental studies are now being made with some of these types.

Production Capacity

The Imperial Japanese Navy has always been particularly interested in the heavy-oil engine; but up to the present moment the Junkers-Diesel is the only type in the world which has proved to be practicable.

It is to be regretted that one cannot report on the progress of Japan's engine production during the past three years. While major engine parts (exhausts, pumps, etc.) have for a long time been produced in Japan, the ignition equipment, and especially magnetos and plugs, have been manufactured only since 1933. The magneto produced by the Kokusan-Denki and the Yokagawa-Denki, and the sparking plugs of the Aichi-Kagaku-Kogyo and the Yokagawa-Denki, are the best-known products in this line.

The production capacity of the engine industry has rapidly developed since the Sino-Japanese war; new works have been established in many localities. Particularly large are the Musashino Works of the Nakajima firm, the Mitsubishi Yata Works and the Akashi plant of Kawasaki. In contrast to the methods of the German industry, they produce their own engine parts, including castings, forgings, etc. Since during the last three years further works have been established, it is possible to appreciate the quantitive resources of Japan's Air Forces engaged at present in distant theatres of the Eastern-Asiatic war.

Since the zone of operations of Japan's Air Arm necessitates long-range operations over mountainous country and wide oceans, economy in fuel consumption and high reliability of the power plant is imperative. For operations in uncivilised countries, far from home bases and under restricted maintenance and repair facilities on aircraft carriers, the construction of engines must of necessity be highly reliable and simple.

BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

From Vichy

FOR the first time since the Vichy armistice with Germany, an "Aviation Week" was organised in France. A small exhibition in the Casino at Vichy was arranged to illustrate the present state of the aircraft industry and flying activities. Lectures were given on the future development of commercial air transport and even on the "French Air Force in the war 1939 to 1940."

German Research

THE establishment of another aeronautical institute is reported to be planned by the *Luftwaffe*. This institute, which is to be affiliated to the Heidelberg University, is to embrace a number of subjects related to aeronautical science. The study and research programme covers aviation, medicine, physiology, chemistry and mathematics. It is interesting to note that special researches are to be made in the field of aeronautical terminology.

The German Version

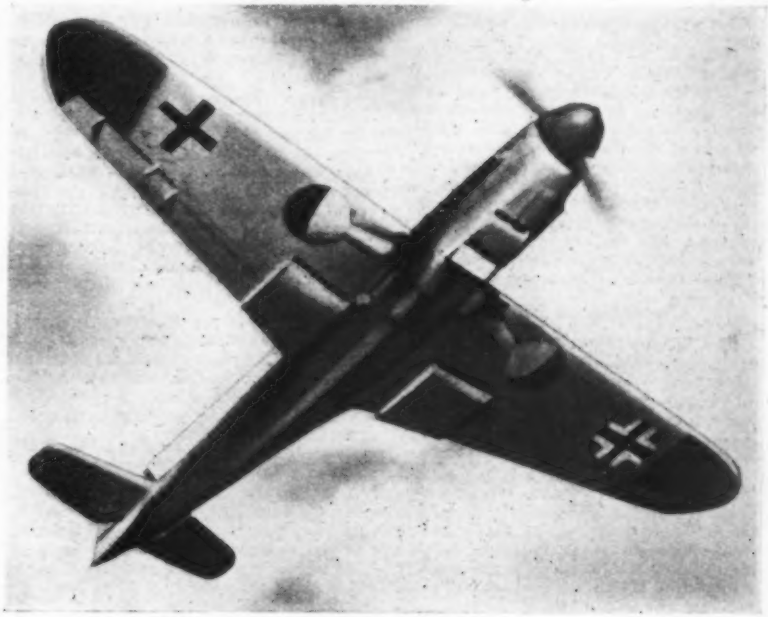
AN official German report attributes to the operations of the *Luftwaffe* a large share in the German success in North Africa. It is stated that German and Italian air formations under General Field Marshal Kesselring have paved the way for the capture of Bir Hacheim, Acroma and Tobruk. The close co-operation between reconnaissance and battle units of the *Luftwaffe* is particularly emphasised.

The report states that "About 550 vehicles which were to bring urgent supplies for the British Armoured brigades were destroyed. The loss in rolling stock had disastrous consequences for the British in the battles for Bir Hacheim and Tobruk. In those critical phases of the battle they were unable to furnish their troops with adequate fuel and munition supplies."

The employment of dive-bombers is mentioned throughout the report. Thus it is said that "concentrated attacks of dive-bombers have enforced the capitulation of the troops closed in God el Aleb." Furthermore, "dive-bomber formations were effectively used to wipe out numerous fortified artillery posts in the Bir Hacheim sector hammered on concentrations of armoured units in the rear and were particularly effective in attacks on British armoured formations.

"On June 18th the encirclement of Tobruk was completed. Junker 87 and 88 smashed with their bombs of heavy and extra-heavy calibre the forts and fortifications of that city. In these other operations mobile flak batteries, advancing to forward areas, were employed against enemy positions with extraordinary success."

In contrast to reports of previous battles, where complete air superiority was always claimed, this report indicates that *Luftwaffe* fighter units had to wrestle for the domination of the air space.



A new photograph of the Me 109F which shows the plan form of the wings, the ducted radiators and the outwardly retracted undercarriage.

DECK STOWAGE: The rubber dinghy carried beneath the top decking of the fuselage of what appears to be a Ju'88.

French Flying Boat

THE Potez-SCAN 161 six-engined flying boat is now reported to be undergoing flying trials at Biscarosse, near Bordeaux. Another six-engined flying boat, the S.E.200 (previously known as the Liore and Olivier Le'O 49) has been put into construction at the S.N.C.A. du Sud Est works at Marseilles-Marignane.

Nationalised

GENERAL CHRISTIANSEN, Chief of the Nazi Flying Corps (N.S.F.K.) has ordered that all German glider pilots are to discard the wearing of the international Efficiency Badge for Soaring Pilots.

An "international" symbol is apparently considered too dangerous and is being therefore substituted by a purely German "Grand Badge for Glider Pilots."

IN PARLIAMENT

Joint Training : Gongs for Ops. : Middle East Army C.-in-C. to Decide

Army Co-operation Training

Major C. S. Taylor asked the Secretary of State for Air on how many occasions in the last three months joint training operations have taken place in this country between units of the Army and the Royal Air Force.

Captain Balfour: In addition to the joint training provided by Army Co-operation Command, which goes on every day, there have been over 100 exercises with the Army in the last three months in which aircraft of Bomber or Fighter Command have taken part.

Operational Medals

Flt. Lt. Boothby asked the Secretary of State for Air whether he will consider issuing an operational medal to all pilots and members of air crews who have completed a certain number of operational trips, or a certain number of hours of operational flying.

Capt. McEwen: No praise can be too high for the superb gallantry and determination of our operational squadrons, but my right hon. Friend feels that the course suggested would not be in the best interests or traditions of the Service. It is doubtful whether the special distinction which would thus be conferred would be welcome to the officers and airmen concerned, since they know full well that many pilots and air crews who are anxious to take part in operations must be employed on duties of a less spectacular kind which are nevertheless indispensable and call for high qualities of courage and skill. The proposal to distinguish between one type of service and another would react adversely upon the efficiency of the Royal Air Force as a whole.

Flt. Lt. Boothby: Will my hon. and gallant Friend bear in mind that under the present system some operational pilots can take part in, say, thirty operations with complete success, but, owing to the fact that no untoward incidents take place, they do not get any recognition? Will he not consider issuing Service medals to all operational pilots who have taken part in quite a small number of operations?

Capt. McEwen: I will bring that point to the attention of my right hon. Friend. I would, however, point out that it is thought that the automatic issue of medals or badges might become so common as to have little significance.

Mayo Composite Aircraft

Major Milner asked the Secretary of State for Air whether any use has been, or is being, made of the Mayo Composite Aircraft for the swift transport of fighters.

The Joint Under-Secretary of State for Air (Captain Harold Balfour): The possible application of the Mayo principle has been considered from time to time, but other methods have been found more suitable for the purpose to which the hon. and gallant Member refers.

Major Milner: Why has this invention not been used, having regard to the great necessity for mobility of fighter squadrons? Is the right hon. and gallant Gentleman aware that this British invention has been well tried out and proved, and why is it not used in present circumstances?

Captain Balfour: To build or to modify aircraft specially for one particular purpose when that purpose can be achieved by readier methods would not be economical. This principle has been considered on many occasions by technical experts, in conjunction with the Air Staff, who know the operational requirements, and if my hon. and gallant Friend wants any further information, I shall be glad to give him further technical details.

Mr. Levy: Is my right hon. and gallant Friend aware that this sidestepping of British inventions which are of benefit is detrimental to the scientific people, who realise that whatever they do to help the war effort is being sidestepped in some way or other?

Mrs. Tate: Is not the Mayo aircraft a perfectly idiotic invention?

Captain Balfour: I think the hon. Lady has in part answered the Supplementary Questions. The invention is an admirable one for a particular purpose, but not for the purpose suggested in the Question.

Question of Command

Major C. S. Taylor asked the Prime Minister whether the aircraft allocated to General Auchinleck for the campaign now being fought in the Middle East are under his direct command for operations.

The Prime Minister (Mr. Churchill): On October 7th, 1941, before the winter battle in Libya, I gave a ruling on this subject as follows:—

"Upon the Military Commander-in-Chief in the Middle East announcing that a battle is in prospect, the Air Officer Commanding-in-Chief will give him all possible aid irrespective of other targets, however attractive. The Army Commander-in-Chief will specify to the Air Officer Commanding-in-Chief the targets and tasks which he requires to be performed, both in the preparatory attack on the rearward installations of the enemy and for air action during the progress of the battle. It will be for the Air Officer Commanding-in-Chief to use his maximum force for these objects in the manner most effective. This applies not only to any squadrons assigned to army co-operation permanently, but also to the whole air force available in the theatre."

This direction is agreeable to both Services and has been in force ever since.

Mr. Bellenger: Will my right hon. Friend consider the desirability of something stronger and more effective than even a direction from him? Would it not be desirable for these two Services even before battle is joined to act in closer co-operation in training than they are doing at the present time?

The Prime Minister: I have carefully considered this matter and taken a great deal of different opinions on the subject, and the result, as I believe, has been satisfactory.

Major Taylor asked the Prime Minister whether, in view of the fact that the Army in this country have had little opportunity of training jointly with the Royal Air Force, steps are now being taken to allocate to Army commanders a larger proportion of aircraft for this purpose.

The Prime Minister: The joint training of the Army and the Royal Air Force is already proceeding on a considerable scale and is being continually extended. The aircraft of Army co-operation command, which is itself being substantially expanded, are occupied solely on such training. Squadrons of Bomber and Fighter Command are also regularly used for this purpose.

Major Taylor: Is my right hon. Friend not aware that certain units of the Army of high priority very rarely see aircraft at all?

The Prime Minister: Of course, this subject is capable of extensive discussion, but we have to try and find the true and proper course between, on the one hand, not having aircraft attached to the infantry, which would be a misfortune, and, on the other, keeping large masses of aircraft which are required for major purposes standing by on specialised functions.

Mr. Glenvil Hall: Has the Prime Minister had any reports as to whether the inter-communication between the aeroplane and the man on the ground is quite satisfactory?

The Prime Minister: I would not say it is quite satisfactory, but it is being pressed forward with the utmost energy, in complete accord with both the Services concerned and the technical branches which are at their disposal.

Captain Plugge: Are the recently formed Army Air Corps entirely limited to gliders, and cannot they use any power-driven machines?

The Prime Minister: The whole question of air-borne troops, whether it concerns the gliders which may be attached to machine with power, whether it concerns parachute troops themselves, or whether it concerns the aircraft which are power-driven and tow the gliders—all these are under one organisation and are being studied as a whole.

Mr. Henderson Stewart: Is it not a fact that most leaders of the Army have expressed themselves most strongly that it is essential for the Army, if it is to do its proper work, particularly as in Libya, to have a part of the Air Force clearly under its control?

The Prime Minister: If my hon. Friend reads my statement at leisure, he will see that I go further than that. The entire Air Force is subordinated to the purposes of the military commander; he says what he wants them to do, but, naturally, you must not interfere with the characteristics of a particular arm. How the purposes are carried out is a matter for the Air Officer Commanding.

Captain Godfrey Nicholson: Will the Prime Minister consider appointing an Air Liaison Officer?

The Prime Minister: I should be glad to consider it, but I should not like to answer the Question without having had the benefit of that process beforehand.

AMERICAN MILITARY TRANSPORT

Douglas C-54 Ordered in Large Numbers for U.S. Army Air Forces : Developed from Commercial Type D.C.-4

THE article on "Mobility" in last week's issue drew attention to the ever-growing need for rapid transport of troops, equipment and supplies in modern warfare. This country cannot be said to have been well served in that respect, and the last type of bomber-transport to be ordered was the Bristol Bombay. Other types have, of course, been used extensively by the Royal Air Force, but must inevitably be a somewhat makeshift substitute since they were not designed specifically for the work.

Apart from the amount of transport done by the R.A.F. itself, British Overseas Airways are carrying much urgent material and many passengers whose presence in distant places is of urgent national importance. The B.O.A.C. is having to carry on with a heterogeneous assortment of types (somewhere in the region of 20), a fact which must inevitably make their task much more difficult, in view of the large assortment of spares, etc., which has to be kept at and transported to different points on the routes.

One of the reasons for our lack of suitable air transport equipment, in the R.A.F. as well as outside it, is that we had few commercial types of high performance before the war. The evil of that short-sighted policy is now obvious, but there is little that we can do about it. Mr. Churchill expressed the position very well in his debate speech the other day when he said: "Much though we need transporter aircraft, I am not at all sure, if I were offered 1,000 heavy bombers or 1,000 transporters, which I should choose. Well, I should take advice." (Incidentally, the Prime Minister's use of the word "transporter" is interesting. It is short and descriptive.)

The United States of America started the war with a strong commercial air fleet—although some of her critics regard it as lamentably small and insignificant—and when the need arose her services were able to impress numbers of commercial aircraft. The American Government, however, has not been content to let it go at that. Large numbers of Douglas C-54s have been ordered for the U.S. Army Air Forces.

The C-54 has been developed from the commercial D.C.-4, which, in point of fact, did not find very great favour with American operating companies. The original machine had a span of 138ft., a loaded weight of 65,000 lb., and was powered by four Pratt and Whitney Hornet engines, each developing 1,400 h.p. for take-off. Operators did not consider the type entirely suitable, and a smaller version was produced, having a span of 117ft. and a loaded weight of 47,000-48,000 lb., according to the engines fitted (four Wright Cyclones or four Pratt and Whitney Twin-Wasps).

The C-54 resembles the smaller rather than the larger D.C.-4 in its lines, but no information has been released concerning its dimensions, so that it is difficult to judge from which of the two types it has been developed.

As a guide to the sort of performance likely to be attained by the C-54 one may recall that the larger commercial machine had a speed of 226 m.p.h. at 12,000ft., while the smaller was claimed to do 257 m.p.h. with the Cyclone engines and 259 m.p.h. with the Twin-Wasps.

A FIVE-WHEELED TRICYCLE UNDERCARRIAGE: The Douglas C-54, on order for the U.S. Army Air Forces, is a development of the D.C.-4 commercial type but differs from it in many respects. The single fin and rudder shown in the upper picture are of typical modern American shape, and replace the triple tail arrangement of the original machine.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"THE RIGHT TO THINK"

Wrong Statement Issued to the Press

IN your issue of June 25th, under the heading "The Right to Think," you attribute to me a statement which I never made. What I said in the film talk to which you refer is recorded on the film.

The fault, however, is not yours. On urgent representations from the U.S. Press, a midnight search was conducted for a copy of the statement which I made. Owing to an error on the part of a night duty clerk, an original first draft, with which I disagreed and subsequently largely altered, was mistakenly forwarded and issued to the Press without my knowledge. A. T. HARRIS, Air Marshal.

AD ASTRA

Which is the Right Wright ?

MR. REG. JUDSON is in error when he says, in your issue of July 2nd, that the Wright Brothers' first machine at the Science Museum is not the original machine, but is merely a replica built by them.

Although, as everyone knows, it was badly damaged by being blown over by a gust when standing on the ground at Kitty Hawk after its flight on December 17th, 1903, I can say from my personal knowledge in America during the past 30 years that, apart from necessary repairs, it is the original machine and is by no means a replica. Both Lord Brabazon and I know this for a fact, and I feel Mr. Judson's statement requires a definite contradiction. GRIFFITH BREWER.

ECONOMY IN DESIGN

Hawker Hurricane Rudder Post

I HAD occasion to go into the question of the manufacture of this rudder at the Hawker works, for a firm, and have often wondered why the rudder post is not made from one length of steel tube instead of two.

The rudder post has an extension tube fitted at the bottom end after it has been squared in a rolling machine, and is fitted inside the main tube. It is held in place with tubular distance pieces and rivets, the additional length gained being roughly about 6in.

I made enquiries to find out if it could be made in one length, thereby saving time, labour and materials, but was informed that it would affect interchangeability. It does not appear to me that this is the case.

It seems that increased area had been found necessary on the rudder at some time, and the cheapest way to carry this out without alterations to press tools for ribs would be to increase the overall length; but is the two-piece tube still essential in these days of restricted supply?

D. P. MUIRHEAD.

ALTITUDE RESEARCH

Freezing of Hydraulic Fluids

I WISH to comment on the statement which was made in the very interesting article entitled "Altitude Research" appearing in your issue of June 25th, namely, that aircraft hydraulic fluid freezes at −40 deg. F. (−40 deg. C.).

Lest this statement should discourage any designers concerned with the development of aircraft hydraulic systems which may have to operate at the very low temperatures experienced at high altitude, I would like to point out that whereas fluids of the castor oil/alcohol type usually start to crystallise between −35 deg. and −40 deg. C. (−31 deg. and −40 deg. F.), the mineral base fluids which are now more commonly used have appreciably lower freezing points. In fact, it is now possible to produce a mineral base hydraulic fluid which will still flow at temperatures lower than would ever be experienced in flight.

Incidentally, it would be interesting to have any information from readers, where they are permitted to divulge it, concerning particularly low temperatures which have been authentically recorded at high altitude.

By the way, I notice that Fahrenheit degrees are used in the article in question. I feel sure that much confusion would be avoided if the use of the Centigrade scale only were stipulated in all aeronautical and other scientific discussions of this kind. "AERO."

ODDITIES

A.T.A. Pilot Supports "W. G. H."

JOHN DARLINGTON'S letter regarding the improbability of well-known test pilots landing at R.A.F. airfields in light civil aircraft without arousing suspicion, and your correspondent "W. G. H.'s" reply quoting as an instance Mr. H. J. Penrose, chief test pilot of Westlands, taxi-ing past "Spits" in the Widgeon G-AAGH, interested me.

Before joining A.T.A. I was with Westland Aircraft, and occasionally had the privilege of flying the Widgeon to airfields to enable Mr. Penrose to return quickly to the factory, and I have never encountered any incredulous officers whilst doing this and, I am sure, neither has Mr. Penrose.

Incidentally, for its age I think the Widgeon is an excellent machine, for it is now, I believe, 12 or 13 years old, and I should not imagine that there are many aircraft operating now which are much older, with one exception—the Avro 504K, which I saw some time ago.

Will anyone correct me? L. T.

WAR CRITICS

Expert Comment to Improve Discussion

THE Man-in-the-Street cannot be a war expert, yet he connot to-day remain uninterested in war. So the Man-in-the-Street (or the train, the club or the pub) discusses war both in general and in particular.

Here are some of the basic ideas which I have heard discussed and have written down in some sort of order. I suggest that one of your war experts could comment on each of them. Even a mere "true" or "false" against some of them might give a sounder basis for discussions.

1. The purpose of war is to impose one's will upon the enemy, and to achieve this purpose it is necessary to destroy his armed forces.

2. Strategy is the art of disposing one's forces over the face of the earth for this purpose, and tactics is the art of employing those forces effectively when those of the enemy are encountered.

3. Success in strategy and tactics consists in bringing superior forces to bear at the vital points at the right times and so employing them as to destroy those of the enemy.

4. The armed forces of the enemy, which must be destroyed, are based on and must live by the land. Ships (including aircraft carriers) must have ports and aircraft must have airdromes. Neither can remain at sea or in the air indefinitely. The present positions of the enemy's main armed forces are well known.

5. The strategical movement of large, heavily armed and heavily armoured forces can at present only be by land or by sea, and their *ultimate* objective is always on the land.

6. Successful operations by land need command of the land, of the air above it (aircraft, A.A. fire, searchlights, etc.), and of the earth beneath it (saps and mines). Successful operations by sea need command of the sea, of the air above it (aircraft, A.A. fire, searchlights, etc.), and of the water beneath it (submarines, mines, torpedoes and depth charges).

7. For land operations and for sea operations, the success of the operation will depend upon unity of purpose, unity of planning and unity of execution. This needs unity of command, as distinct from co-operation, which is a euphemistic phrase meaning dual (or triple) control.

I feel that if the ordinary man could be given expert comments on such fundamentals, or perhaps a revised set of better basic principles, he would be more fitted to appreciate the relative dispositions of our own and of the enemy's forces, and particularly of the air weapon, when he discusses such events as Flanders, Norway, Greece, Crete, Singapore, the English Channel, the Indian Ocean, Cologne and Tobruk.

C. A. S. DAMANT.

STOP-BUTTLESS : Testing the eight-gun installation of a Fairey Fulmar on the deck of an aircraft carrier.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

"*The London Gazette*," *July* 3, 1942.

Air Marshals to be Air Chief Marshals (temp.), July 1, 1942:

Sir Richard E. C. PEIRSE, K.C.B., D.S.O., A.F.C.
Sir W. Sholto DOUGLAS, K.C.B., M.C., D.F.C.
Sir Arthur W. TEDDER, K.C.B.

Awards

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

BAR TO THE DISTINGUISHED SERVICE ORDER.

Wing Cdr. J. RANKIN, D.S.O., D.F.C. and Bar, R.A.F.O.—Since he was awarded the D.S.O. in November, 1941, Wing Cdr. Rankin has completed 54 operational sorties. On all these occasions he led the wing which destroyed 27 enemy aircraft and damaged many more. Of these Wing Cdr. Rankin personally destroyed three and damaged at least eight enemy aircraft. This officer has now brought his total victories to 21 enemy aircraft destroyed. He has at all times displayed great tactical skill, courage and leadership, combined with a great determination to seek and engage the enemy.

DISTINGUISHED SERVICE ORDER.

Wing Cdr. J. H. CHAPLIN, D.F.C., No. 38 Sqn.—One night in June, 1942, Wing Cdr. Chaplin led a force of seven aircraft to attack a large enemy vessel escorted by three destroyers. Despite the most intense fire from all the vessels, he pressed home the attack from point blank range. The ship was hit, and later reports confirmed that it had been sunk. Wing Cdr. Chaplin has led a considerable number of attacks against enemy shipping in the Mediterranean, and has set a magnificent example by his courage, enthusiasm and fine leadership.

Sqn. Ldr. J. S. SHERWOOD, D.F.C. and Bar, No. 97 Sqn.—On the 17th April, 1942, Sqn. Ldr. Sherwood was the leader of one of two formations of six Lancaster bombers detailed to deliver a low-level attack in daylight on the Diesel engine factory at Augsburg. He led the formation at very low level across 600 miles of enemy territory. On approaching the target heavy and accurate anti-aircraft fire was encountered. Nevertheless, showing fine daring and coolness, Sqn. Ldr. Sherwood pressed home the attack at a very low level, scoring hits on the factory with his bombs. His aircraft was then hit by anti-aircraft fire and set alight.

He continued, however, to lead his section away from the target until his aircraft became uncontrollable. By his extreme devotion to duty Sqn. Ldr. Sherwood contributed much towards the success of the operation, and continued his daring leadership until his aircraft could no longer be flown. His conspicuous bravery on this occasion crowned a long and distinguished career in the service of his country.

Act. Flt. Lt. D. E. HEALY, R.A.F.V.R., No. 210 Sqn.—Flt. Lt. Healy, P/O. Schofield and Sgt. Kingett, as captain, navigator and wireless operator/air gunner respectively, have consistently displayed great skill, courage and devotion to duty in the execution of their duties. They were selected as members of the crew of a Catalina flying boat which was recently detailed for certain special operations. Four flights have been completed, involving a total distance of 9,500 miles, much of which was flown in the most severe weather and icing conditions. Nevertheless this crew, displaying superb skill and undaunted determination, accomplished their task successfully. They displayed magnificent fortitude throughout.

P/O. A. B. HARVEY, R.A.F.V.R., No. 600 Sqn.—One evening in June, 1942, P/O. Harvey and F/O. Wicksteed were the pilot and observer respectively of a Beaufighter which attacked a Heinkel 111 flying at sea level and about to attack a convoy. During the combat the starboard engine of the Beaufighter was set on fire and put out of action and the port engine also sustained damage. Despite this, P/O. Harvey continued his attack, and set the port engine of the Heinkel on fire. The enemy aircraft was soon burning fiercely, and was lost to the sight of P/O. Harvey through the smoke and flames from his own engine.

Knowing that he would be unable to regain his base, P/O. Harvey advised his observer to abandon the aircraft. Displaying great coolness and exemplary courage, F/O. Wicksteed, however, continued his duties, preparing for the crash by strapping his pilot in and refusing to prepare for his own escape. When the crash occurred, F/O. Wicksteed was momentarily trapped in the aircraft, but eventually succeeded in escaping in an exhausted condition and without a dinghy.

P/O. Harvey assisted F/O. Wicksteed into his own dinghy and swam towards the shore, about seven miles distant, pushing the dinghy in the process. After an hour P/O. Harvey became exhausted and got on to the dinghy himself. When some 200 yards from the shore he left the dinghy and swam to the shore, scaled a cliff and walked to the sector operations room, where he organised a search party to return and rescue his observer. The courage and devotion to duty displayed by P/O. Harvey undoubtedly saved the observer's life. Both officers displayed considerable gallantry during this sortie.

BAR TO THE DISTINGUISHED FLYING CROSS.

Act. W/O. H. V. PETERSON, D.F.C., R.C.A.F., No. 10 Sqn.—One night in June, 1942, W/O. Peterson was the captain of a Halifax aircraft detailed to attack Essen. Whilst over the target the aircraft was held by strong searchlight cones and subjected to intense anti-aircraft fire. The port

Wing Cdr. J. H. Chaplin, D.F.C. (No. 38 Squadron), who has been awarded the D.S.O. The official citation appears on this page.

SERVICE AVIATION

outer engine was hit and ceased to function. The windscreen was also damaged, and a piece of Perspex entered W/O. Peterson's left eye. Nevertheless, he continued to take evasive action, and eventually set off on the return journey. Whilst over Holland, flying at 11,000 feet, he was attacked by an enemy fighter. His rear gunner delivered a short burst, which caused the enemy aircraft to burst into flames and dive away out of control. When crossing the Dutch coast the aircraft was again subjected to anti-aircraft fire, and the starboard engine was put out of action. Despite W/O. Peterson's injury and the severe damage sustained by the aircraft, he succeeded in flying back to this country and landing on an airfield with which he was unfamiliar. W/O. Peterson displayed fine courage and determination throughout.

DISTINGUISHED FLYING CROSS.

P/O. E. SCHOFIELD, R.A.F.V.R., No. 210 Sqn.—For citation see Flt. Lt. Healy.

F/O. B. B. WICKSTEED, R.A.F.V.R., No. 600 Sqn.—For citation see P/O. Harvey.

Act. Sqn. Ldr. H. C. KENNARD, No. 121 (Eagle) Sqn.—Sqn. Ldr. Kennard has completed 58 offensive operations since he was appointed to command the squadron in January, 1942. In May, 1942, he led the squadron in a successful combat against eight enemy aircraft, two of which were destroyed, one probably destroyed, and another damaged. A few days later he led a flight in a successful attack against a minesweeper. Later in May, 1942, Sqn. Ldr. Kennard led his squadron to attack an armed trawler off the Dutch coast. The trawler was observed to sink. Sqn. Ldr. Kennard has commanded his squadron skilfully, and has set an excellent example at all times.

Act. Sqn. Ldr. J. R. PENNINGTON-LEGH, No. 175 Sqn.—This officer has always shown great keenness to engage the enemy, and has done so with consistently good results. The squadron, under Sqn. Ldr. Pennington-Legh's excellent leadership, has sunk an enemy destroyer and a minesweeper, and has probably sunk or seriously damaged a further four warships. In addition, the squadron has attacked enemy airfields and inflicted considerable damage.

Flt. Lt. S. R. C. WOOD, R.A.A.F., No. 10 (R.A.A.F.) Sqn.—Flt. Lt. Wood was the captain of a Sunderland aircraft which attacked a U-boat in the Bay of Biscay. Shortly afterwards the Sunderland was attacked by an enemy aircraft. Severe damage was inflicted on the attacker, and it is unlikely that the aircraft was able to return to its base. Despite the damage sustained by the Sunderland, Flt. Lt. Wood succeeded in bringing his aircraft back safely. The cool courage and determination consistently displayed by this officer have set an excellent example.

Act. Flt. Lt. A. J. ANDREWS, R.A.F.V.R., No. 91 Sqn.—Flt. Lt. Andrews has completed 220 operational sorties, in which he has displayed great skill in reconnaissances of shipping and in attacks on enemy vessels. He has shown a keen desire to engage the enemy in the air, and has probably destroyed two Me. 109s and damaged other hostile aircraft.

Act. Flt. Lt. W. W. MCCONNELL, R.A.F.V.R., No. 174 Sqn.—Flt. Lt. McConnell has completed a large number of operational sorties both by day and night, and has shared in the destruction of two enemy bombers. He was appointed flight commander in March, 1942, and has since led his flight, and on occasions the squadron, in many successful bombing operations. These have included both high- and low-level attacks against airfields and factories and against enemy shipping at night. Despite intense opposition, Flt. Lt. McConnell has displayed fine leadership and determination, which have contributed largely to the successes achieved by his squadron. He has proved himself an excellent flight commander, and has set a fine example.

Act. Flt. Lt. G. C. PANNELL, R.N.Z.A.F., No. 91 Sqn.—Flt. Lt. Pannell has completed a large number of operational sorties, including patrols, sweeps, shipping reconnaissances, and flights as escort to bombers. He has displayed an exceptional enthusiasm for operational flying, and a keen desire to engage the enemy. In October, 1941, this officer was leading an air escort provided for an Air Sea Rescue operation. The formation was attacked, but, showing fine leadership and tenacity, Flt. Lt. Pannell succeeded in protecting the rescue craft, and in destroying personally one of the attacking aircraft. In all, he has destroyed two enemy aircraft and damaged several more.

Act. Flt. Lt. B. R. WALMER, R.C.A.F., No. 403 (R.C.A.F.) Sqn.—Flt. Lt. Walker completed 14 operational sorties before joining his present squadron. He has since participated in 38 fighter sweeps over France and has led the squadron on three occasions. In April, 1942, he led a flight in a successful attack made by the squadron against a formation of enemy aircraft. One hostile aircraft was destroyed and several others damaged. Flt. Lt. Walker has proved himself to be a courageous and skilful leader and has set a fine example.

F/O. W. T. H. HOWELL, No. 23 Sqn.—This air observer has participated in 38 sorties with the squadron. His skill as a navigator is of a high order, and he has displayed great calmness as a bomb aimer. F/O. Howell has shown extreme keenness for operations which has been an example to others.

P/O. G. W. BREWER, R.N.Z.A.F., No. 107 Sqn.—In June, 1942, P/O. Brewer, who was engaged on his first operational flight, was the pilot of one of six Boston aircraft detailed to attack shipping and the docks at Dunkirk. On approaching the French coast the formation was subjected to extremely heavy and accurate anti-aircraft fire. P/O. Brewer's aircraft was hit in numerous places and the hydraulic system was rendered useless.

P/O. Brewer received a shrapnel wound in the thigh which rendered his leg useless. Despite the pain and the loss of much blood, he bombed his objective successfully and maintained formation during the return flight to base. Knowing that he was without brakes, he brought his aircraft in to land and avoided crashing by running it to a standstill through a dispersal area. P/O. Brewer thereby saved his crew from injury. He displayed high courage and devotion to duty and set an excellent example.

P/O. E. W. WHITNEY, No. 149 Sqn.—On the night of June 5th, 1942, P/O. Whitney and Sgt. Cheek were the pilot and wireless operator respectively of a Stirling aircraft detailed to attack the Ruhr. Whilst over the target, the aircraft was held by searchlights and subjected to heavy anti-aircraft fire from which considerable damage was sustained. Despite this, P/O. Whitney pressed home his attack and dropped his bombs in the target area. When leaving the target the aircraft was again hit by anti-aircraft fire and a fire was started in the front turret. This was, however, eventually extinguished. The aircraft was then involved in a collision with another aircraft and damaged at the rear.

Sgt. Cheek inspected the damage and informed the pilot. During his passage along the aircraft he received a wound in the arm, but, ignoring his injury, he returned to his cabin and sent out a message giving information as to the condition of the aircraft. While sending this message an attack was made by an enemy fighter and the wireless aerial was shot away. Other damage was also inflicted which caused height to be lost rapidly. Although injured and in great pain, Sgt. Cheek repaired his wireless set and succeeded in informing base of the position.

P/O. Whitney, displaying skilful airmanship and great determination, eventually succeeded in alighting on the sea eight miles from the Belgian coast. The crew escaped by dinghy and all were rescued. This was largely due to the courage and calm devotion to duty displayed by Sgt. Cheek in sending his messages.

Flt. Lt. R. N. DALKIN, R.A.A.F.—This officer has displayed gallantry and devotion to duty in operations against the enemy in the Darwin area. On several occasions he led his flight against intense anti-aircraft fire and fighter attack and dived and released his bombs at very low altitudes. Afterwards, in the face of similar opposition, he attacked with machine-gun fire enemy flying-boats and bases at Koepang. His personal courage and quality of leadership proved an inspiring example to his squadron.

W/O. K. S. THOMPSON, No. 23 Sqn.—This air observer has taken part in 55 operational sorties, of which 36 have been undertaken with his present squadron. In April, 1942, he bombed and destroyed a Heinkel III on the runway at Evreux. W/O. Thompson has displayed great keenness in his work and his navigation is of a high order.

Sqn. Ldr. F. W. S. TURNER, R.A.F.O., No. 419 (R.C.A.F.) Sqn.—This officer has had a long experience of operational duties both by day and night. He took part in an attack on the German Fleet off Heligoland on September 3rd, 1939, and in a number of subsequent daylight attacks on Heligoland and Wilhelmshaven. Since January, 1940, he has completed numerous sorties, including attacks on the enemy's industrial centres and dockyard towns. He has displayed courage and keenness throughout and has performed excellent work in organising his flight and in training the crews.

Act. Sqn. Ldr. P. H. CRIBB, No. 35 Sqn.—This officer has participated in attacks on a wide range of enemy targets. These include Oslo, Aalborg, Stavanger, Bremen, Hamm and many other important centres. His devotion to duty, regardless of the opposition, has set a fine example to all.

Act. Sqn. Ldr. D. F. E. C. DEAN, No. 77 Sqn.—This officer, who has a fine operational record, has carried out his duties with vigour and determination and set a high standard to his squadron. When as a second pilot he was forced to alight in the North Sea, his courage and cheerful spirit under most arduous conditions proved of great help to the fellow members of his crew. He has now completed an operational tour in which he has participated in attacks on Germany and German occupied territory.

Act. Flt. Lt. J. CATANACH, R.A.A.F., No. 455 Sqn.—On three occasions, in spite of severe damage

A three-quarter front view of the Avro Lancaster, showing the disposition of the four Merlin engines and the front gun turret above the bomb aimer's position.

SERVICE

sustained by his aircraft, this officer flew it back to base and landed without further damage or injury to the crew. Flt. Lt. Catanach has made successful attacks on Hamburg, Essen, Cologne, Lorient and Lubeck.

Act. Flt. Lt. M. R. EVANS, R.A.F.V.R., No. 149 Sqn.—This airman pilot has completed sorties against a wide range of enemy targets, including Berlin, Kiel, Stettin, Brest and Essen. He has always shown great enthusiasm and determination in the performance of his tasks. On one occasion, when detailed to attack an airdrome in Norway, although he had only 2½ hours in which to make his preparations, he carried out a most successful raid. On another occasion, when attacking Berlin, his aircraft was forced down almost to ground level. Despite this, he bombed his target from 100 feet. On the return journey his aircraft was attacked by a Ju.88. Flt. Lt. Evans skilfully evaded his attacker, and it is believed that the enemy aircraft was shot down. This officer, who has been employed as captain of aircraft since April, 1941, has set a fine example.

Act. Flt. Lt. J. F. C. GALLAHER, R.A.F.V.R., No. 51 Sqn.—This officer has taken part in raids on Dusseldorf, Wilhelmshaven, Frankfurt, Hamburg and many other well-defended targets. He has participated in several long-range flights, during which his brilliant navigation has contributed materially to the safe return of his aircraft. He has performed a great deal of valuable work in training other observers of the squadron.

Act. Flt. Lt. R. FROWDE, R.A.F.V.R., No. 214 (F.M.S.) Sqn.—Flt. Lt. Frowde has proved himself to be an excellent captain, a first-class pilot and a most reliable officer. Throughout the numerous sorties in which he has participated he has shown commendable perseverance and determination. Often in spite of intense opposition from the ground defences he has remained over the target area for considerable periods of time to achieve a maximum bombing effort. This officer has set a most praiseworthy example.

Act. Flt. Lt. D. MILLER, R.N.Z.A.F., No. 50 Sqn.—This officer joined the squadron in August, 1941, as a Captain of aircraft and has carried out numerous operational missions, many of which were in the winter months. He has shown great determination in locating and bombing his targets. He took part in the combined operations on Vaagso where he laid a smoke screen on Naalov Island in the face of intense anti-aircraft fire. On the following night he scored hits on the Buna factory at Huls. He also participated in the low level raid on the Renault works at Paris. His outstanding courage and devotion to duty have been an inspiration to others.

Act. Flt. Lt. F. PICHEL-JUAN, R.A.F.V.R., No. 144 Sqn.—This officer has set a magnificent example as an air gunner during his two years continuous service in operational bombing squadrons. While serving in another Squadron he flew on several operations as rear gunner in the squadron commander's crew, and was responsible for shooting out searchlights while operations were being carried out from a low level. He has taken part in successful raids on Kiel and Lubeck.

Act. Flt. Lt. L. F. RATCLIFF, R.A.F.V.R., No. 49 Sqn.—This officer has completed numerous sorties, including attacks on Frankfurt, Essen, Kiel and Hanover. All his work has been characterised by the greatest determination to reach and bomb his objective. On the night of 28th December, 1941, on the outward journey to Huls, his aircraft was intercepted by two enemy fighters. Despite bright moonlight, he skilfully evaded his attackers, and flew on to Huls where he bombed the synthetic rubber plant. On another occasion in January, 1942, when flying to attack the German warships at Brest he showed great skill which enabled his gunners to frustrate the attacks of two enemy fighters. Flt. Lt. Ratcliff has set a very valuable example.

Act. Flt. Lt. F. SYMMONS, D.F.M., R.A.F.V.R., No. 115 Sqn.—Since July, 1940, this officer has been employed as a navigator. In January, 1941, whilst serving as a non-commissioned officer, he was granted an award of the D.F.M. for his excellent work in connection with raids on Kiel and Mannheim. In December, 1940. On all his sorties he has done everything in his power not only to identify his target, but to bomb it accurately and photograph the results. He has obtained numerous night photographs, including successful ones of Hamburg, Berlin, Cologne, Essen, Mannheim and Lubeck. After the attack on Lubeck, Flt. Lt. Symmons obtained four highly successful photographs, taken over a period of 30 minutes, which completely covered the area of the town which was on fire. Apart from his work in the air, this officer has performed valuable work as squadron bombing leader and in the development of night photography. Flt. Lt. Symmons is a courageous and most efficient officer.

Act. Flt. Lt. S. D. WATTS, R.N.Z.A.F., No. 77 Sqn.—Throughout his tour of duty, this officer has displayed courage and leadership of a high degree. In September, 1941, whilst returning from an operational sortie his aircraft sustained much damage when attacked by an enemy fighter. Although the starboard engine failed, Flt. Lt. Watts evaded the enemy and succeeded in flying his damaged aircraft across the North Sea after losing height to 200 feet, and eventually he made a forced landing on the Norfolk coast.

In October, 1941, his aircraft was hit by shell-fire which rendered the rudder useless. Thus handicapped, Flt. Lt. Watts skilfully flew his aircraft back to this country where he executed a crash-landing successfully. This officer has participated in many attacks on highly defended targets, including Kiel, Wilhelmshaven, Brest, Huls, Frankfurt and Hamburg.

F/O. R. L. BARTLEY, R.A.F.V.R., No. 50 Sqn.—This officer after five sorties with the squadron as a navigator was appointed Captain of aircraft. As such, he carried out many sorties, including attacks on Essen, Hamburg, Kiel, Cologne and, recently, on the Renault works in Paris. On the night of 7th December, 1941, he was detailed to attack Aachen. Whilst over the target area, at 7,000 feet, his aircraft was hit by anti-aircraft fire and severely damaged. Despit this, he succeeded in flying the damaged aircraft back to this country where he made a safe landing at base in darkness without injury to his crew or further damage to his aircraft. He has at all times shown the greatest determination to complete his alloted tasks.

Flt. Lt. C. G. ROBERTSON, No. 95 Sqn.—Flt. Lt. Robertson has been a member of a Sunderland air crew since November, 1939. He was appointed captain in March, 1941, and during this period he has completed 2,000 flying hours of which 1,780 have been on operational flights. Flt. Lt. Robertson has displayed outstanding qualities of leadership and reliability. He has completed his missions cheerfully under adverse weather conditions. On one occasion he located three lifeboats containing 57 survivors from a merchant vessel which had been torpedoed in the Atlantic. He alighted, transhipped the survivors to the aircraft and despite a confused ocean swell, succeeded in taking off and bringing them back without any damage to the aircraft.

F/O. G. W. GILPIN, R.A.F.V.R., No. 51 Sqn.—As a pilot, F/O. Gilpin has continuously shown determination and courage in pressing home his attacks often at low altitude and in the face of intense opposition. Since May, 1941, he has carried out numerous attacks on industrial centres and dockyard towns both in Germany and in German occupied territory. His devotion to duty has set a fine example.

F/O. J. H. LELAND, No. 207 Sqn.—This officer is a capable captain who takes great interest both in his aircraft and in his air and ground crews. When acting as second pilot on his first operational flight he gave every possible assistance to his captain when it became necessary to fly back from Berlin on one engine. Practically all his operational flights have been carried out with great determination despite most unfavourable weather. Since September, 1941, F/O. Leland has participated in many successful raids, which include Berlin, Rostock, Brest and Paris.

Wrens installing radio equipment in a Royal Naval Albacore torpedo bomber.

AVIATION

Act. F/O. D. BOOKER, R.A.F.V.R., No. 51 Sqn.—This officer has been employed as an air observer in the squadron since April, 1941. He has participated in numerous attacks on a variety of the enemy's important industrial centres and dockyard towns, including Frankfurt, Aachen, Hamburg, Kiel, Brest, Wilhelmshaven and St. Nazaire. He has displayed great ability which, during very difficult and unfavourable circumstances, has enabled him to navigate his aircraft to the target successfully when a number of others have failed. His skill and determination have played a large part in the successes obtained.

Act. F/O. F. M. CRITCHLEY, R.A.A.F., No. 115 Sqn.—As navigator, this officer has completed 23 sorties, including bombing attacks on Bremen, Kiel, Hamburg, Essen and Poissy. Throughout, he has displayed exceptional ability, particularly during the winter months in adverse weather and often in hazardous circumstances. On three occasions he has been largely responsible for the safe return of his aircraft. F/O. Critchley's repeated examples of cool determination have had an inspiring effect on all navigators of the Squadron.

Act. F/O. A. G. W. LIVINGSTONE, R.A.F.V.R., No. 138 Sqn.—As witeless operator-air gunner, this officer has participated in 58 bombing and special operations both from home and overseas bases. On several occasions his efficiency has contributed largely to the safe return of his aircraft. His fighting qualities and enthusiasm have set an inspiring example to new air crews.

P/O. R. V. BROAD, R.A.F.V.R., No. 115 Sqn.—This officer is an extremely efficient first wireless operator who, apart from his primary duties, is fully conversant with many of the duties of the remainder of the air crew. On a recent sortie he displayed great coolness and resource when a shell splinter broke the main pressure feed fuel pipe and petrol was being lost at the rate of two gallons a minute. P/O. Broad held the severed pipe together until help arrived from other members of the crew. He then spent half an hour effecting a temporary repair, working in fumes which, at times, made him sick. Although it was impossible to stop the wastage completely, his effort effectively reduced it. For the next two hours he took turns, with the navigator and second pilot, in holding the binding tightly together. P/O. Broad has participated in attacks on many highly defended targets, including Brest, Wilhelmshaven, Hamburg, Kiel and Cologne. He is a keen and courageous officer.

P/O. J. K. CLIMIE, R.N.Z.A.F., No. 75 Sqn. (N.Z.).—This officer has acted as captain of aircraft on 23 occasions. He has participated in 53 sorties, the majority of which have been against heavily defended targets, including two attacks on Berlin and six on Brest. He has always displayed the greatest keenness for operations. He is a skilful and confident pilot.

P/O. A. JACKSON, R.A.F.V.R., No. 207 Sqn.—This officer has already carried out a tour of operational flying. The majority of this Air Observer's operational flights on his second tour have been undertaken in most adverse weather, but this has in no way lessened his great determination and keenness to identify and bomb his primary targets. He has taken part in successful raids on Kiel, Dusseldorf, Frankfurt, Berlin and Rostock. He is an observer of outstanding quality, and the success of many sorties can be attributed to his good work.

P/O. J. P. MCCARTHY R.C.A.F., No. 142 Sqn.—This officer has completed over 30 sorties over enemy territory, including attacks on industrial centres, dockyard installations and other important targets. During the past month he has participated in several sorties against targets in the Ruhr. Throughout his long tour this officer has displayed a high standard of efficiency, while his conduct in adverse circumstances has earned high praise.

P/O. K. R. MILLER, R.A.F.V.R., No. 76 Sqn.—P/O Miller has completed 25 sorties and not once has he experienced a navigational failure. He has bombed targets in many parts of Germany and the occupied countries, including centres such as Cologne, Bremen, Kiel, Brest and Hamburg. On December 18th, 1941, he was chosen as bombing leader of the squadron on a daylight raid on the German warships at Brest. Excellent photographs which he obtained showed his bombs bursting across the docks. This officer's operational tour has been curtailed by his posting to an O.T.U. where his knowledge and keenness will be most valuable.

P/O. L. P. OLIVER, R.A.A.F., No. 455 (R.A.A.F.) Sqn.—This Australian observer joined the squadron in September, 1941. He has participated in sorties, which have included attacks on Huls, Kiel, Hamburg and other important enemy targets. Many of these missions have been completed in extremely unfavourable weather and in the face of heavy opposition. By his fine work, this officer has contributed materially to the many successes obtained. On March 3rd, 1942, P/O. Oliver participated in the highly successful attack on the Renault Works in Paris. Everything that P/O. Oliver attempts is

SERVICE AVIATION

marked by the greatest keenness for the job in hand. Throughout he has proved a very valuable member of the aircraft crew.

P/O. E. W. D. ROY, No. 207 Sqn.—This officer has served with the squadron since April, 1941, having previously had operational experience on Blenheims. He has participated in numerous attacks on important targets in enemy and enemy occupied territory. He has always shown exceptional keenness and efficiency both in the air and on the ground. His fine team work has contributed materially towards the successes achieved. His technical knowledge and practical application have been of a high standard.

W/O. A. R. HUNTER, R.C.A.F., No. 408 (R.C.A.F.) Sqn.—This observer has participated in numerous sorties, three of which have been in daylight. He has attacked several targets in the Ruhr area; he also took part in the attack on the Renault works in Paris. W/O. Hunter has shown exceptional skill and ability as navigator, and his determination and devotion to duty have contributed to the success of his operational sorties.

W/O. S. W. YARKER, No. 103 Sqn.—W/O. Yarker has proved himself to be a most successful air observer. His skilful navigation, accurate bombing and determination to secure good night photographs have been outstanding. On the night of April 2, 1942, he participated in a low-level attack on the Matford works at Poissy. Whilst flying over the target area at 3,000 feet, his aircraft was subjected to heavy fire from the ground defences. It was hit in the port wing root and the fuselage and set on fire. W/O. Yarker, who was lying in the bomb aimer's position, struggled to the back and endeavoured to extinguish the flames with his hands. Unsuccessful, he ran forward, collected a fire extinguisher and, after instructing the wireless operator to remove the photographic flash bombs, proceeded to extinguish the flames. He then skilfully navigated the extensively damaged aircraft back to this country. By his skill, presence of mind and determination, this airman was largely responsible for the safe return of his aircraft.

DISTINGUISHED FLYING MEDAL.

Sgt. G. V. KINGETT, No. 210 Sqn.—For citation see Flt. Lt. Healy.

Sgt. E. G. CHEEK, No. 149 Sqn.—For citation see P/O. Whitney.

Flt. Sgt. D. R. MORRISON, R.C.A.F., No. 401 (R.C.A.F.) Sqn.—Flt. Sgt Morrison has displayed outstanding ability and skil as a pilot during combats with the enemy He has destroyed two and damaged several other enemy aircraft, besides sharing in the destruction of two others. Flt. Sgt. Morrison has participated in 57 operational sorties, and in May, 1942, after his port elevator had been shot off by enemy cannon fire near Le Havre, he successfully brought his aircraft back to this country and performed a difficult landing with little additional damage.

Sgt. B. C. GROVES, No. 10 Sqn.—One night in May, 1942, Sgt. Groves was the tail gunner of a Halifax aircraft engaged on operations. When over the target he was wounded by enemy fire. Nevertheless, he continued to fire his guns at searchlights and enemy gun positions while the aircraft lost height from 14,000 feet to only 200 feet. He was wounded again in the arm and in the eye, and his turret was rendered unserviceable. He was thus forced to cease fire. His difficulties were still further increased as the turret doors became jammed and he was unable to get out. During the whole of the engagement, which lasted 25 minutes, Sgt. Groves gave no indication that he had been so badly wounded. He displayed fortitude, courage and tenacity of a high standard.

Sgt. S. A. JONES, No. 118 Sqn.—Sgt. Jones has been engaged on operational flying for more than a year and has completed over 100 sorties. These have included flights as escort to our bombers, fighter sweeps, and successful low-level cannon attacks against land targets and shipping. Sgt. Jones has displayed fine leadership, keenness and determination, and has set a splendid example.

Sgt. W. R. YOUENS and Sgt. G. A. C. CARRINGTON, both of No. 38 Sqn.—One night in May, 1942, Sgt. Youens and Sgt. Carington were the pilot and observer respectively of an aircraft which made a daring attack on a convoy in the Mediterranean. A hit with a torpedo was scored on an 8,000-ton motor vessel. Intense heavy anti-aircraft fire was encountered, from which the aircraft sustained damage, but, by displaying skilful flying and navigation, these airmen brought the aircraft to an advance base safely after an operation lasting eight hours.

Sgt. R. DURHAM, No. 57 Sqn.—This airman has displayed considerable ability as a navigator. His cool determination when attacking targets has contributed much to the successes achieved by his crew. During a flight to Berlin, in September, 1941, his aircraft failed to receive a recall signal, and flew on to the target, where a successful attack was made from 5,000 feet, despite very heavy opposition from the ground defences.

Sgt. J. K. ELLIOTT, R.A.F.V.R., No. 144 Sqn.—This wireless operator/air gunner has displayed great enthusiasm in his work both on the ground and in the air, and has always set a high standard of efficiency During a daylight attack on Brest, in the face of most intense anti-aircraft fire, Sgt. Elliott handled his wireless set with great skill and greatly assisted in the safe return of his aircraft to its base. He has participated in raids on many important industrial targets in enemy territory.

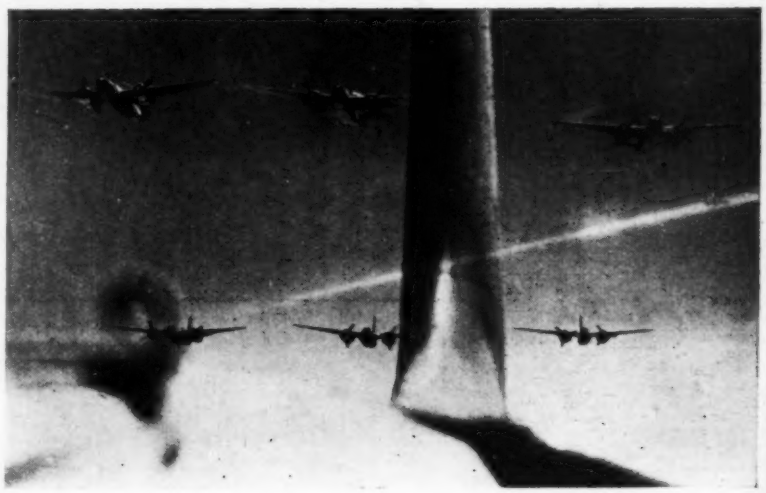
Flt. Sgt. T. D. GRANT, No. 51 Sqn.—Flt. Sgt. Grant, an air gunner, has shown great ability and keenness both in the air and on the ground. Since joining his present squadron, he has participated in 23 sorties. His keenness and efficiency have done much to raise the squadron to its present high operational standard. He participated in many anti-submarine patrols whilst serving in Coastal Command.

Sgt. J. HIGHET, No. 115 Sqn.—This wireless operator-air gunner has completed 34 sorties, several of which have been against long-distance targets in adverse weather. His skill in obtaining fixes and bearings has played a major part in the safe return of his aircraft under most trying conditions. Sgt. Highet is an airman of initiative and resource who has carried out his duties with the utmost efficiency.

Sgt. L. D. H. IZZARD, No. 35 Sqn.—Sgt. Izzard is a wireless operator-air gunner of outstanding ability. He has displayed great enthusiasm to take part in actions against the enemy, and has, at all times given valuable radio assistance during the heaviest engagements and under difficult weather conditions. Sgt. Izzard has a magnificent record and has set a fine example. He has participated in three raids on Berlin, and his trips have included flights to many of the most strongly defended targets.

Sgt. J. F. JENKINS, No. 115 Sqn.—Sgt. Jenkins, a wireless operator-air gunner, has participated in 33 sorties, including attacks on targets at Berlin, Bremen, Brest, Cologne, Le Havre, Stettin and Turin. He has displayed outstanding ability and his skill and resource have, on many occasions, contributed largely to the successful results obtained on long-distance operations under difficult conditions. On one occasion, when a dinghy was located 50 miles off the East Coast, it was due to this airman's skill that rescue craft were able to search the area. Apart from his excellent work as a member of air crew, he has, in his spare time, assisted in the training of junior wireless operators.

Sgt. T. LEITHEAD, No. 51 Sqn.—Sgt. Leithead is a skilled and courageous wireless operator-air gunner. He joined his present squadron on the 12th May, 1941, and since that date he has been employed continuously on operations. He has displayed outstanding ability, particularly in an attack on Frankfurt in October, 1941, when he was responsible for the safe return of the aircraft after a flight which lasted 9½ hours. His keenness and devotion to duty have been an inspiration to other air crew personnel.



South African Bostons in formation. During the recent battles in Egypt two squadrons of the S.A.A.F. carried out 62 sorties in a period of 19 hours.

Sgt. D. A. LLOYD, No. 76 Sqn.—Sgt Lloyd is a navigator of outstanding ability and courage. Throughout his operational tour he has shown discipline and devotion to duty of a high standard. He is one of the keenest astro navigators in the squadron, and his success in this form of navigation is proved by the fact that he has never had a navigational failure.

Sgt. A. G. MASKELL, R.A.F.V.R., No. 57 Sqn.—This airman's operational flights have included two raids on Berlin and one on Brest in daylight. He has at all times shown great keenness both as a gunner and wireless operator, and his general bearing is an example to all. He has also displayed the utmost coolness and efficiency when under enemy fire.

Sgt. T. MACL. MACKENZIE, No. 214 (F.M.S.) Sqn.—Sgt. Mackenzie, a captain of aircraft, has displayed exceptional zeal and energy in the performance of his duties, which have been reflected in the results achieved. He has taken part in 34 major operations which have included raids on important enemy docks and factories.

Sgt. R. C. W. MCMULLAN, No. 115 Sqn.—This airman has proved himself to be an exceptional rear gunner. He has also displayed a complete disregard of danger and his alertness has, on several occasions, prevented enemy fighters from carrying out attacks against his aircraft. On a recent sortie Sgt. McMullan observed an enemy fighter closing in slowly from below and astern. He calmly waited until the aircraft came within 300 yards when he fired an accurate burst with his guns which caused the fighter to pull away violently and disappear.

Flt. Sgt. S. W. MERRYWEATHER, No. 174 Sqn. (since deceased).—Since November, 1939, this pilot has participated in a number of operational patrols and offensive sorties. When in France, in May, 1940, he destroyed one Me. 109 in combat and another while patrolling over Dunkirk during the evacuation. He damaged another enemy aircraft during the Battle of Britain. Flt. Sgt. Merryweather has also taken part in many bombing attacks on factories and enemy airfields. His skill and determination are a source of inspiration to his fellow pilots.

Sgt. C. TERRY.—Sgt. Terry made his first operational flight as front gunner of an aircraft which participated in the mass raid on Cologne of May 30th, 1942. On observing one of our bombers being attacked by an enemy aircraft, his clear instructions enabled his captain to manœuvre the aircraft into a position from which Sgt. Terry was able to open fire at short range. At the first burst, the enemy aircraft caught fire and entered a curling dive. Shortly afterwards, Sgt. Terry skilfully drove off another enemy aircraft which was attacking one of our bombers. Two nights later this airman was the front gunner of an aircraft operating against the Ruhr. Whilst over Holland, on the return flight, Sgt Terry observed a Focke Wulf 190 and shot it down in flames into the sea. By his keen observation, clear thinking and accurate gunnery this airman has destroyed two enemy fighters, and probably saved his own and two other bombers from destruction.